15c

The OIL WEEKLY

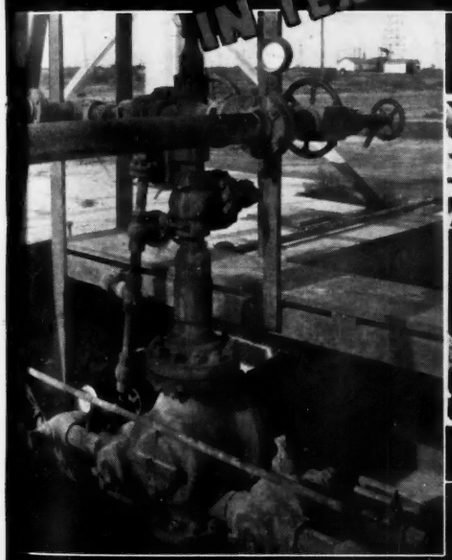
OIL and GAS ENGINEERING

FOR OIL AND GAS PRODUCERS AND PIPE LINE MEN

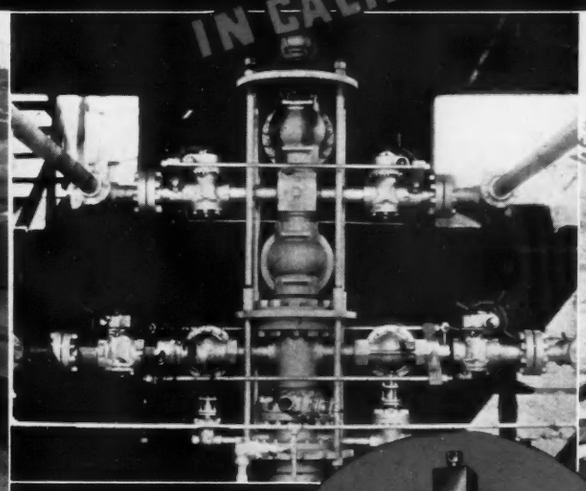
THE WEEK'S NEWS INTERPRETED

IT'S THE SAME STORY IN ALL 3 STATES

IN TEXAS

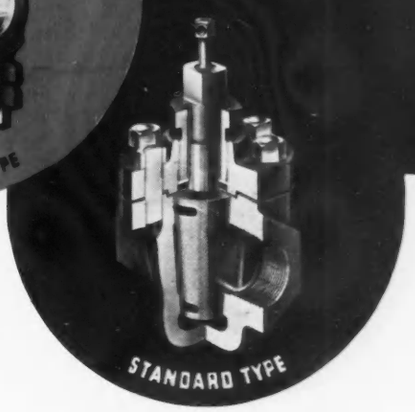


IN CALIFORNIA



IN OKLAHOMA

TO HOLD PRESSURES PERMANENTLY AND POSITIVELY-*install*



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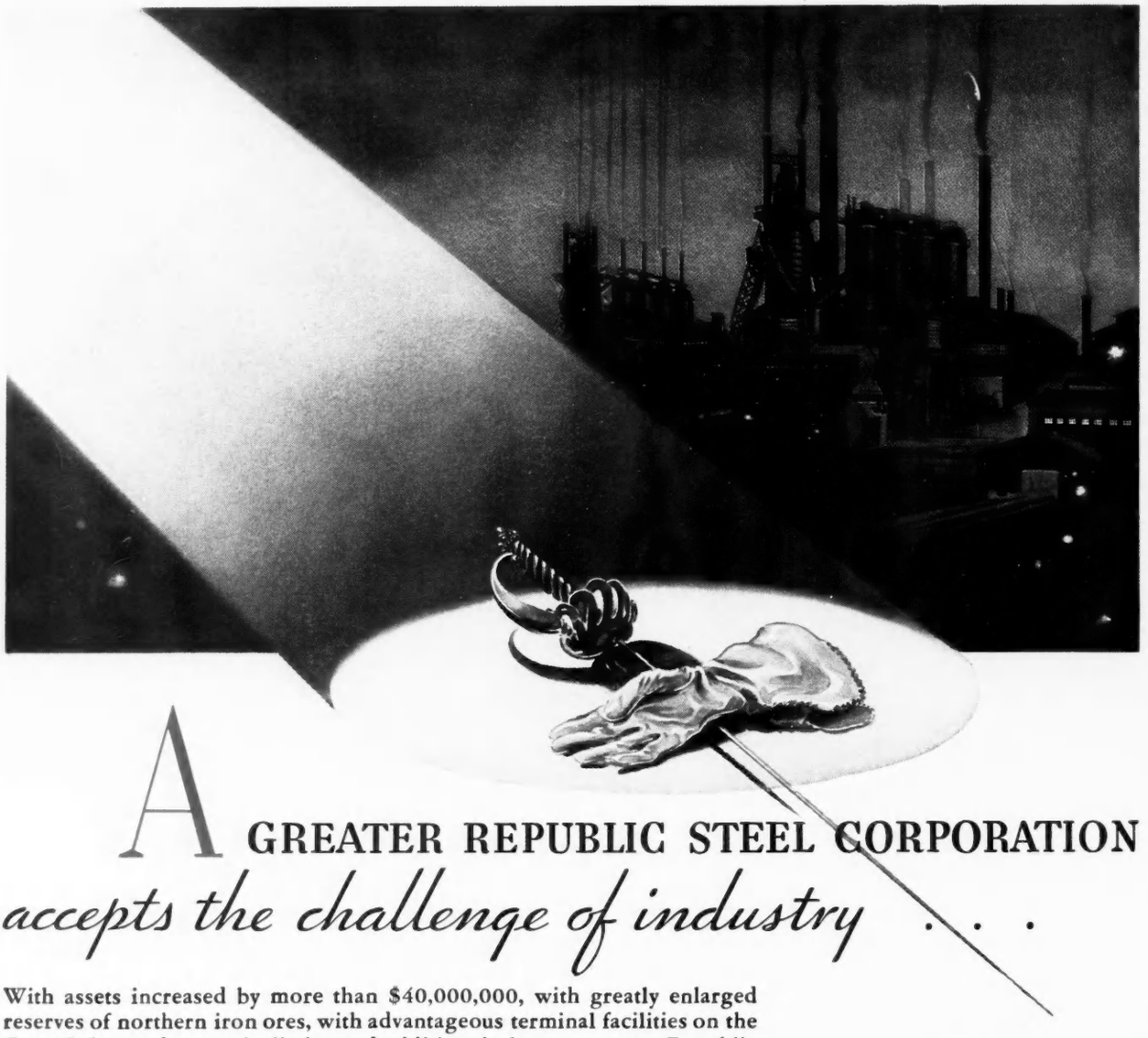

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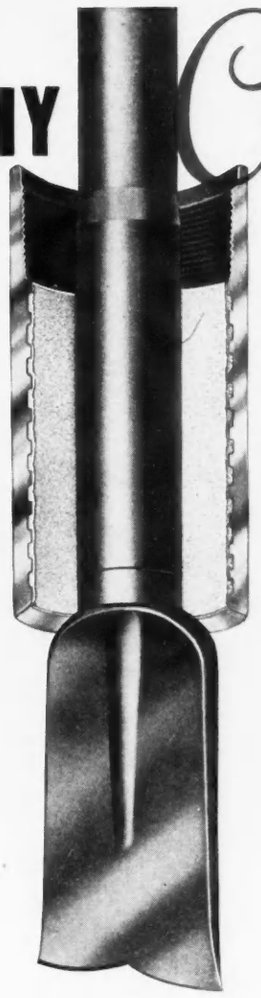

REVIEW the steps taken to bring your well in—get on with your casing operation,—you've guided the casing safely, floated it safely into the well, and cemented it in. Now you are vitally concerned with the internal construction of the float shoe which will either cause loss of time in drilling out the plug and valve assembly, fill your hole with dangerous metal to handicap future operations, OR will drill out easily, giving minimum wear in the bit and circulate out of the hole, thus eliminating the danger of metal or other harmful fragments being left in the hole.

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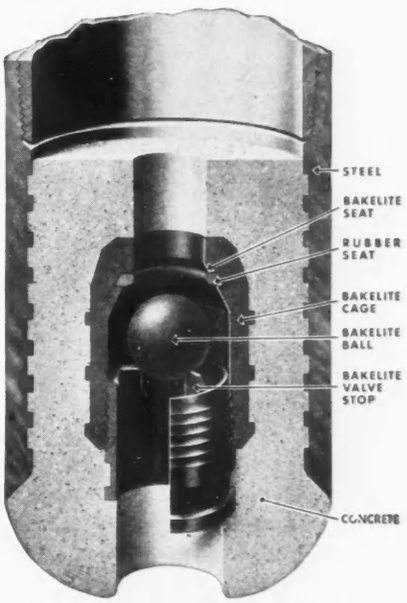

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MANY a good driller got his start as a roughneck on a crew superintended by John Coates (right), of Tyler, Texas. This veteran operator is known throughout the industry for his careful methods. Here Mr. Coates is passing on his knowledge of drilling methods to his son, Alton (left). Photograph was taken on the platform of F. Williams 2-A, John Coates' well near Longview, Texas, just before this 10,000 bbl. producer was cemented with 'Incor.'

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THE OIL WEEKLY

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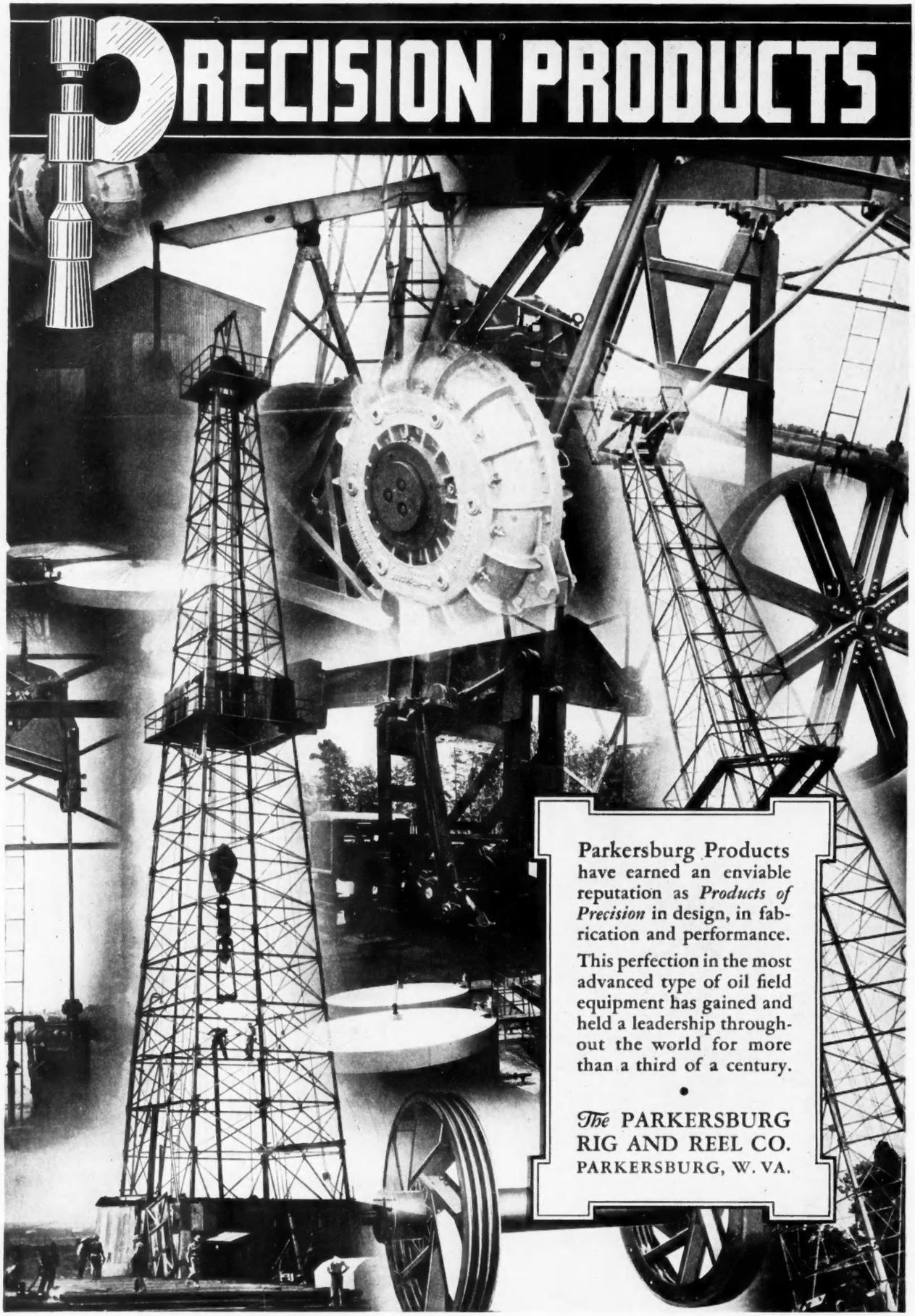
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THE OIL WEEKLY

FOR OIL AND GAS PRODUCERS
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ENGINEERING • NEWS • STATISTICS

WARREN L. BAKER, Editor.

. . . this Week

NO danger of a national crisis caused by a shortage of oil, at least not for 25 years; federal control of the oil industry fast losing its advocates, even among public office holders; approval of state regulation of production with the assistance of an interstate compact; no hope for a California conservation statute in the next few years — according to speeches delivered at Los Angeles before the sixteenth annual convention of the American Petroleum Institute. **Page 8.**

RECOMMENDATIONS made by various committees at the Los Angeles gathering included adoption of a standard drilling contract form, early announcements of subjects to be considered in research during the coming year (with mud and heaving shale playing a prominent role), a definite program of source bed research. Full details of the work of these committees during last week's session of the American Petroleum Institute being on **Page 9.**

THE long expected ban on shipments of petroleum products to Italy came November 15 following a conference between Secretary of State Cordell Hull and President Roosevelt which resulted in the secretary's declaration that while oil did not necessarily come under the classification of "arms, ammunitions, or implements of war," shipments thereof were in contravention of the administration's policy of neutrality. **Page 12.**

OIL company earnings in 1935 are expected to be about a third higher than in 1934, and the highest since 1930. Further improvement in earning power is anticipated, moreover, for the coming year. Twenty-six oil companies, including virtually all the leading units in the industry, will show net profit of $225,000,000 in 1935, it is estimated. That figure compares with $170,000,000 for last year, with $303,000,000 in 1930, and with a peak of $649,000,000 in 1929. **Page 12.**

A TEXAS court has made an important ruling regarding payment of the state's gross production tax on crude oil. The court held that the oil producer is liable for the tax on only his share of the oil produced, while the royalty owner similarly is liable for the tax on his share. The state collects the tax, however, in a single payment, made by the producer. **Page 15.**

A NEW world's record in deep drilling may be set eventually by a West Texas test which last week was drilling at 11,055 feet. The well is being drilled in search of production from the Ordovician lime. Although the test may set a new record, it still has about 1750 feet to go before equaling the present world's record, held by another West Texas well. **Page 15.**

ARE you interested in one of those studies of pumping which discusses maximum production rate as secured by deep tubing, adequate pump capacity, elimination of free gas from the pump, and low casinghead pressure? These things, as well as the elemental factors of obtaining minimum lifting costs are discussed on **Page 39.**

A STUDY of properties of fluids is vitally important in dealing with energy relations in a flowing well. Two technologists of the California Institute of Technology present herein a paper purposing to present some experimental results for a particular case and to indicate how they may be used to analyze the energy relations in a producing well's flow through the tubing. **Page 31.**

THERE is a lack of a uniform system for the evaluation of rotary-drilling lines, therefore the presentation of a formula, including an alignment chart for graphical solution, for determining the work done by drilling lines in terms of ton-miles is of interest. Tabular values of such factors as drill-pipe weights and similar variables, and a discussion of methods used also is of interest and value. **Page 19.**

HEAVING shale, horror of many Gulf Coast prospects, finally has been conquered by three wells, one of which is completing in oil sand at 8853 feet. Twenty-seven wells at Sheppards Mott, Matagorda County, Texas, failed before the solution was discovered. These projects bring to light new chemical and mechanical advancements. **Page 46.**

UNITED STATES production up 32,000 barrels per day over last week, making it about 270,000 barrels in excess of indicated market demand. Yield in Michigan and Rocky Mountain States down due to cold weather; Oklahoma, Kansas and Texas responsible for the week's increase. **Page 55.**

The Oil Man's Calendar

NOVEMBER

29 Society of Petroleum Geophysicists, Dallas, Texas.

DECEMBER

4-5-6 Standing Committee, Midcontinental Oil & Gas Association, Dallas, Texas.

10 Mid-Continent Oil & Gas Association, Tulsa, Oklahoma, (Date tentative).

MARCH, 1936

19-21 American Association of Petroleum Geologists. Tulsa, Oklahoma.

APRIL

11-13 Petroleum Industry Electrical Association, Tulsa Oklahoma.

16-17 National Petroleum Association, Cleveland, Ohio.

20-25 Oil Equipment & Engineering Exposition, Houston, Texas.

MAY

13-15 Natural Gasoline Association of America. Tulsa, Oklahoma.

16-23 International Petroleum Exposition and Congress, Tulsa, Oklahoma.

Federal Control

RESERVE ANALYSIS AND STATE COMPACTS DOMINATE A. P. I.

By GRADY TRIPLETT, Staff Writer.

LOS ANGELES.

THROUGH the program of the Sixteenth Annual Meeting of the American Petroleum Institute, November 11, 12, 13 and 14, the petroleum industry put itself on record as capable of providing the people of the United States with sufficient petroleum products as a private industry. Federal control was frowned upon. State regulation of production with the assistance of the interstate oil compact was approved. Reserves were estimated as sufficient.

These were a few of the impressions from the subjects discussed by leaders of both the industry and officials of two of the oil producing states.

The position of the industry on the question of federal control was outlined by Axtell J. Byles, president, who stated the case of private endeavor as an incentive for finding and developing oil reserves.

The board of directors considered the report of a special committee on reserves and recommended it for printing and study.

President Byles dealt with this report in his address. The substance of this was that from oil, coal and shale there are ample reserves for the nation and that the industry is equipped to develop them.

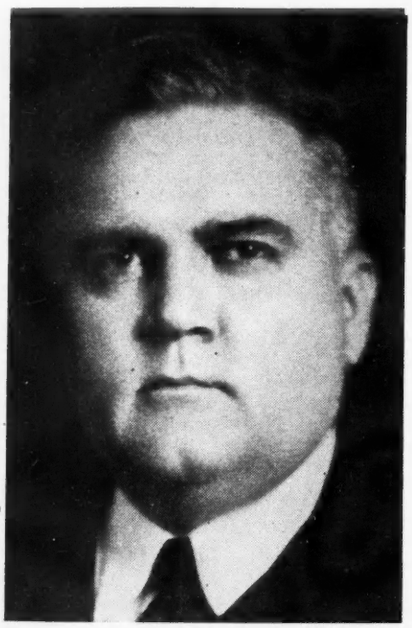
The interstate oil compact was presented by Tom Anglin of Oklahoma, who read the speech prepared by Governor E. W. Marland of that state. Governor Marland was unable to attend. He set out the possible benefits of the compact and presented it as the only constitutional method left to the states for moving as a unit in conserving oil and gas.

Colonel E. O. Thompson, chairman of the Texas Railroad Commission, branded federal control as unnecessary and expressed the opinion that there is not immediate danger of such legislation.

Chicago was selected as the scene for the Seventeenth Annual Meeting, which will be held November 9, 10, 11 and 12, 1936. The Stevens Hotel will be headquarters.

W. R. BOYD, JR.

Re-elected Executive Vice President, American Petroleum Institute



GEORGE A. HILL, JR.

Re-elected Vice President for Production, American Petroleum Institute

AXTELL J. BYLES

Re-elected President, American Petroleum Institute

New Officers

Axtell J. Byles of New York was re-elected president of the institute.

Other officers elected were: Vice President at Large, K. R. Kingsbury, Standard Oil Company of California, San Francisco, re-elected; Vice President for Production, George A. Hill, Jr., Houston Oil Company of Texas, Houston, re-elected; Vice President for Refining, Jacob France, Mid-Continent Petroleum Corporation, Baltimore, to succeed W. G. Skelly, Skelly Oil Company, Tulsa; Vice President for Marketing, C. E. Arnott, Socony-Vacuum Oil Company, New York, re-elected; Executive Vice President, W. R. Boyd, Jr., New York, re-elected; Treasurer, O. D. Donnell, Ohio Oil Company, Findlay, Ohio, to succeed D. J. Moran, Continental Oil Company, Ponca City; and Secretary and Assistant Treasurer, Lacey Walker, New York, re-elected.

The board appointed the following executive committee: F. A. Leovy, Gulf Oil Corporation, Pittsburgh; J. Howard Pew, Sun Oil Company, Philadelphia; E. G. Seubert, Standard Oil Company of Indiana, Chicago; H. F. Sinclair, Consolidated Oil Corporation, New York; W. C. Teagle, Standard Oil Company of New Jersey, New York; J. C. VanEck, Shell Union Oil Company, New York.

The following committee on membership was appointed: D. E. Buchanon, Hanlon-Buchanon, Incorporated, Tulsa; R. A. Bloomfield, Barnsdall Oil Company of California, Los Angeles, W. H. Ferguson, Continental Oil Company, Denver, Colorado; E. J. Bulock, Standard Oil Company of Indiana, Chicago; and Jake L. Hamon, Cox & Hamon, Dallas.

National Politics Out

Nowhere on the program did a man high in the affairs of the national administration appear. However, two men from political families of the two leading oil producing states were on the program.

The difference in the 1935 program of the Institute and the two previous years represents a picture of the change that has occurred in one of the nation's major industries. In Chicago two years ago Secretary Harold L. Ickes of the Department of Interior and administrator of the petroleum code, explained the workings of the partnership between government and industry. Last year in Dallas, Secretary

K. R. KINGSBURY
Re-elected Vice President at Large, American Petroleum Institute

Ickes came back as an institute speaker, and scolded the industry.

The program this year did not call upon any man in Washington to discuss national government proposals for the petroleum industry. Furthermore, several speakers on the institute program predicted lessened federal control agitation. Not only did the official program present the impression that the personnel of the industry is convinced the best operation will come through private endeavor, but casual conversations between friends reflected the same thought.

Crude Reserves Stressed

On two occasions during the meeting crude reserves was the principal subject discussed. It was pointed out that no national crisis caused by a shortage of petroleum products now impends, nor is likely to occur. The nation's proved petroleum reserves are not only 100 percent greater now than 10 years ago, but are adequate to meet the demand for at least 25 years if properly managed, it was declared. Moreover, there is an unlimited supply of petroleum products available from coal and oil shales when needed. These important facts were brought out in a report submitted to the board of directors of the American Petroleum Institute by its executive committee, and by the Institute's president, Axtell J. Byles, in his address. The full text of the executive committee report appears elsewhere in this issue of THE OIL WEEKLY.

It was explained that the report was presented not only to reveal the industry's present position and its future outlook, but also to refute the charges of alarmists that petroleum reserves

[*Continued on page 60*]

Committee Work

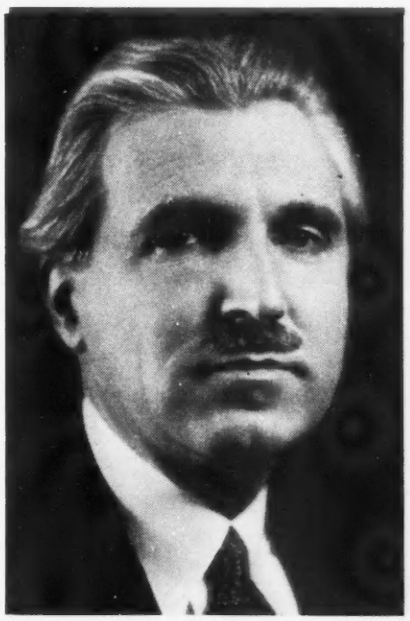
AT A. P. I. MEETING WAS OF OUTSTANDING VALUE THIS YEAR

By BRAD MILLS, Associate Editor.

LOS ANGELES.

TECHNICAL men attending the Sixteenth Annual Meeting of the American Petroleum Institute were enthusiastic in their praise of the general program and developments in the various committee meetings, which, as usual, played an important role in the division of production.

In the first general session the general topic was metallurgy and corrosion. Production engineers and metallurgists discussed steel used in production equipment and the effects of corrosion. Drilling and production practice was featured in next group session. This meeting was sponsored by the central committee on drilling and production practice. The third and final general session stressed drilling mud, setting depths of casing and mud resistance through drill pipe.



C. E. ARNOTT
Re-elected Vice President for Marketing

Committees Very Active

Monday morning considerable progress was made toward standardization of small equipment and of heavier equipment that has changed rapidly during the past three years. Rapid adoption of new equipment items has necessitated a standardization program affecting these changes.

A feature of the meeting of the topical committee on drilling practice was the recommendation for a standard drilling contract form. Further action will be taken toward completion of this work. The meeting was devoted to a symposium on reconditioning wells, drilling fluids, drilling factors contributive to drill stem failures, new advancements in drilling equipment and practices, elements of drilling contract forms, and existing drilling problems.

This committee took recognition of heaving shale as a drilling problem and discussed methods recently used to advantage in drilling heaving formations in the various areas. It was announced at this meeting that the subjects to be featured next year will be "Reconditioning Wells," "Drilling Mud," and "Factors Contributing to Drill Stem Failures." The mud classification will be broken down into subdivisions on "Lost Returns," "Heaving Shale," and other problems.

The joint meeting of the engineering sub-committee on derricks devoted a large part of Monday morning to standardization of sub-structures. No definite recommendations were made and more work will be required before

[*Continued on page 60*]

LACEY WALKER
Re-elected Secretary and Assistant Treasurer, American Petroleum Institute

Petroleum Outlook

SUMMARIZED IN A. P. I. EXECUTIVE COMMITTEE REPORT

THE accompanying article is a full text of a report of the Executive Committee to the Board of Directors of the American Petroleum Institute. It summarizes a survey of the present position of the petroleum industry and its outlook toward the future, discussing such important problems as crude reserves, taxation, motor fuel demand, transportation, refining and legislation. It was delivered at the Sixteenth Annual Meeting of the American Petroleum Institute, Los Angeles.

THE petroleum industry as we know it had its beginning with the discovery, in 1859, that petroleum could be produced from the earth by drilling. Ever since that time there have been periodic manifestations of apprehension lest petroleum resources be exhausted; and in the last two or three years, despite that the industry has been suffering from a surplus rather than a deficiency of petroleum, there has been insistent revival of these alarms. The fact that proven reserves of oil in the ground are now conceded by authorities to be well over 100 percent greater than in the 1925 estimate, has had no influence with the alarmists. They have not only insisted our reserves were in danger of early exhaustion, but have charged the industry with waste and an unwillingness or inability to cooperate in conservation—threatening rigorous governmental control to the point of declaring the industry a public utility, in order to protect the nation's future oil supply.

Outlook Reassuring

Ignorance and misrepresentation of the facts have persistently characterized attacks on the industry; the American Petroleum Institute has deemed it imperative to state the facts. The present report on the current position of the industry and the outlook for the future is its broad general refutation of the allegations against it, and its presentation in some detail of the evidence in support of that refutation.

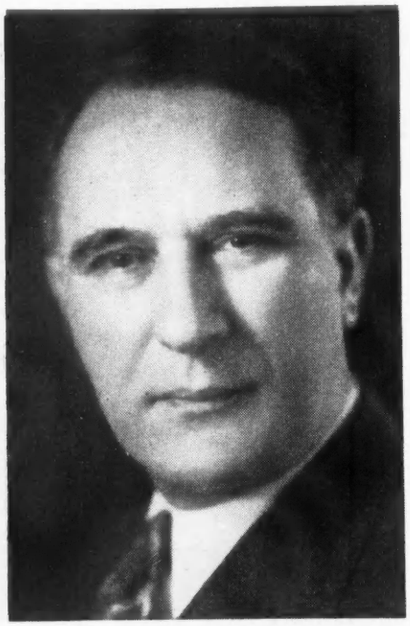
This is not the first time that the industry has been called upon to dispel fears about our petroleum supplies. In 1924, following the creation of the Federal Oil Conservation Board, that action was seized upon by the alarmists and its significance utterly distorted. Charges were renewed that petroleum reserves were being wasted through recklessness and inefficiency. Accordingly, in 1925 the Institute made a thorough study of the industry and its prospects with special reference to petroleum supplies for the future, and published a report, *American Petroleum: Supply and Demand.* That report carefully appraised the then proven resources of petroleum, and called attention to the probability of great additions to these reserves through future discoveries. A conservative document, it made no estimate of the amount that might be brought in through later discoveries. It did estimate the future demand for petroleum with remarkable accuracy.

An Ample Reserve

That report of 1925 calculated the known, proven resources as 5,321,000,000 barrels of petroleum. In the 10 years since then, 8,692,000,000 barrels have been produced; yet the authorities—and they have better standards for accurate judgment than they had 10 years ago—agree that today we have over 12,000,000,000 barrels of proven reserves. But that is not all. In the last decade science technology, and invention have so widened our horizon that whoever is familiar with the facts concedes that the reserves still to be located and developed are much greater than they have ever before been estimated. The geologist and geophysicist have widened our knowledge about oil deposits in the earth and where to look for them. The scientists and technicians have equipped us with better methods for following up and proving these indications. Production engineers have devised methods for greatly enlarging the recovery from all pools. Invention and mechanics have so improved drilling methods that it is now practicable to go to much deeper sands; while the development of better methods and better equipment for lifting make it possible to produce oil from deeper strata.

Conservation Measures

Finally, legislatures of most of the oil-producing states have joined the industry in efforts for conservation, by passing laws which enable the avoidance of certain bad production practices, inevitable under the older laws governing production and property rights in oil. This old theory of property rights in petroleum is based on the primitive law of capture: under it, the oil belongs to whoever can get to it and bring it out of his well. The fact that he brings the oil from his



JACOB FRANCE
Elected Vice President for Refining, American Petroleum Institute

O. D. DONNELL
Elected Treasurer of American Petroleum Institute, Succeeding D. J. Moran

Here's that Moore Derrick I've been blowing about

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Moore

KAY DERRICKS

PUMPING EQUIPMENT

neighbor's land as well as from his own makes no difference; the oil belongs to him who first reduces it to possession. Under that rule competitive and wasteful drilling was long inevitable; floods of oil were produced at times when they were not needed; pools were exhausted before their time, and without producing nearly so much as would have been brought out under an orderly system of equitably controlled operation.

Decade of Advancement

Modern engineering knowledge of the function of gas in producing oil has enabled radical improvement of production methods, whereby greatly increased recoveries are possible. The increases are by many estimated as 50 to 100 percent. Further, better engineering practice and geological knowledge have enabled more accurate determinations as to the location and quantity of oil in the ground. This wider understanding will aid the state authorities in equitably apportioning the production of oil and in enforcing conservation measures. The industry and the states are equally concerned to secure the largest ultimate recovery; and this is the definite aim of measures which both are pressing and in which great progress has been made in the past five years.

Unit operation of pools, while not universally practicable, is desirable wherever feasible. Under it, competitive drilling can be avoided and only that optimum number of wells drilled which will prolong the life of the field and insure its greatest ultimate production. Repressuring with gas and water-flooding of the sands are now established practices, and will be much more widely employed when economic conditions justify and legal obstacles are removed. In most large pools that have been brought in during the last five years these improved methods have been employed, and they have demonstrated their effectiveness. In many pools unit operations embrace all or important parts of the producing area, with resultant large economy in operation and important gain in recovery.

Interstate Compact

So much for the scientific, engineering and legal advances of a decade. Beyond these lies the realm of competition between states in oil production. No state, rich in petroleum, could be expected to regularize, control, and limit production while others were free to produce *ad libitum* and seize the market. There must be cooperation among states in control and conservation. These have recently been initiated in the Interstate Compact to conserve oil and gas.

Under the compact the states may agree among themselves to apportion to each state its equitable share of the total production needed to supply the national demand; and thereafter the conservation authorities of each state can apportion the state's allotment among the fields, pools, and even wells of the state. Such control could not constitutionally be exercised by the national government. It was in anticipation of precisely such situations that the provision for state compacts was written into the federal Constitution. A considerable number of these compacts have heretofore been arranged, dealing with a wide range of interests common to two or more states, all the

[*Continued on page 81*]

Exports to Italy

OIL IS PLACED UNDER BAN OF DISAPPROVAL BY HULL

WASHINGTON, D. C.

EXPORTS to Italy of oil and certain other commodities today were placed under the ban of disapproval by Secretary of State Cordell Hull as essential war materials which, while not actually "arms, ammunition or implements of war" are in contravention of the administration's neutrality policy.

An exhaustive investigation of the export activities in the oil industry has been under way for some time, it was learned, among the developments of the inquiry being the disclosure that a shipment from the west coast of oil for airplane use ostensibly destined for Singapore was allegedly for the use of Italian forces in Ethiopia.

The secretary's ban on oil shipments was issued after a conference with President Roosevelt at the White House at which it is understood the refusal of exporters to abide by the wishes of the administration for the cutting off of shipments of war materials from the belligerents was discussed at length.

Calling attention to previous statements by the president and the secretary of state, Mr. Hull declared, "The American people are entitled to know that there are certain commodities such as oil, copper, trucks, tractors, scrap iron and scrap steel which are essential war materials, although not actually 'arms, ammunition or implements of war,' and that according to recent government trade reports a considerably increased amount of these is being exported for war purposes.

"This class of trade," the secretary continued, "is directly contrary to the policy of this government as announced in official statements of the President and secretary of state, as it is also contrary to the general spirit of the recent neutrality act.

"The administration is closely observing the trend and volume of exports to those countries, and within a few days the department of commerce expects to have complete detailed lists of all commodities exported to the belligerents, which will enable exact comparison with lists for the same period last year."

EARNINGS IMPROVE

Gains of 1935 expected to extend into 1936

THE petroleum industry has had further improvement in earning power in 1935, and present indications point to continued betterment in 1936.

Daily Oil News, published daily at Los Angeles during the API annual convention last week by publishers of THE OIL WEEKLY, carried an exclusive article on oil company earnings that had been prepared by Standard Statistics Company. Basing figures on the estimated profits of 26 companies, including virtually all the leading units in the industry, the company indicated that earnings for 1935 after reserve and fixed charges will aggregate $225,000,000, or 32 percent greater than the total of $170,000,000 earned by the same companies in 1934, and the most since 1930.

This estimate was described as indicating a continuation of the upward trend witnessed subsequent to the deficit operations generaly sustained in 1931. In 1931 the mentioned group of companies had sustained a net deficit of $65,000,000.

The indicated 1935 earnings of $225,000,000 compare with $303,000,000 in 1930 and a peak of $649,000.000 in 1929. While the 1935 profit will be under even the 1930 figure, the company stated that "a recovery of a larger part of former earning power is expected in 1936."

Touching on steady improvement in results during 1935, the report stated that the third quarter was the best for several years and that "there is every indication that the fourth quarter will be as profitable as the preceding three months, if not more so."

Encouraging information on oil company earnings was revealed also in the latest monthly report of Carl H. Pforzheimer & Company, of New York, on oil company securities. The report indicated that in the first nine months of this year 13 oil companies had net income of $53,384,327, or 35 percent more than the $39,550,044 in the similar period last year.

For those 13 companies the net income of $24,290,026 for the third quarter of 1935 was 31 percent higher than in the corresponding period last year.

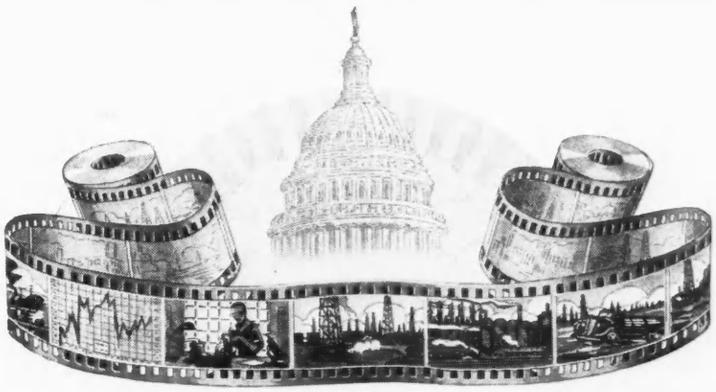
Austin.—The Atlantic Oil Producing Company and several other oil company defendants were awarded title to 416 acres of land in Gregg County through an instructed verdict handed down in Fifty-third District Court last week.

The state sought title to the land, part of the F. W. Johnson Survey, contending that it is unappropriated state school lands. In addition to the property, the state asked $8,300,000 as damages for oil already produced from the property.

Judge C. A. Wheeler held that as a matter of law the land was included within the F. W. Johnson Survey, and, therefore, could not be classed as unappropriated lands.

Attorney General William McCraw announced that he would appeal the case.

The Changing Panorama



THE OIL WEEKLY'S COMPOSITE VIEW OF INDUSTRY

Edited by JACK LOGAN, Associate Editor

CALIFORNIA'S overproduction of crude in recent months has been an ill wind blowing at least some good. The good has been dissipation of some of the fear that the state might overproduce greatly and long.

Turned out of the cage, California has proved to be not so much a fire-breathing dragon as a tamed lion yearning for exercise. Under more or less lack of restraint, the state has given indication that it could not produce greatly above market demand for more than a few months.

Relatively Few California Wells Flow

Further information has become available lately to confirm the foregoing paragraphs. The office of the oil umpire, J. R. Pemberton, has issued its monthly report, "California Oil Field Data," for September, and the report embodied innovations, providing more thorough and complete information.

The report showed, for instance that of the 16,477 wells of the state in September, only 529 wells, or 3.2 percent of the total, were flowing producers. Those flowing wells were furnishing 33 percent of the state's crude production and were responsible for 50.6 percent of the state curtailment.

Meanwhile, 3820 wells, or 23.2 percent of the total in the state, were shut in, being responsible for 34.8 percent of the state curtailment. Pumping wells represented 72 percent of all the wells of the state, but contributed only 10.9 percent of the curtailment of the state.

These figures indicate that at present the problem of controlling California's crude production is largely a matter of curbing about 500 wells. Stated another way, any excessive production at present would appear to arise largely from heavy withdrawals from the 500 flowing wells. And while those wells possibly could produce a considerable period at high rates, they are too few in number to cause serious anxiety.

Potentials of Other States Also Lower

Similarly, the crude oil producing potentials of some other states now appear less fearful than formerly. Oklahoma appears much less formidable than a few years ago as a potential wrecker of crude price structures. On its latest potential tests, the Oklahoma City field showed materially lower producing capacity than six months previously.

Meanwhile, the biggest market menace in Texas, the East Texas field, continues to grow older and slowly but surely nearer toward eventual depletion. Five years old last month, the field has produced over 750,000,000 barrels of oil, which represents possibly a third of its ultimate output. Conroe also is beginning to age, having been on production about 3½ years, although it has produced so far only a little over a tenth of the half-billion barrels of expected ultimate recovery. Van is six years old and already has produced 85,000,000 barrels, or approximately one-fourth of its expected ultimate yield. Yates is nine years old, and although still flowing, it is 40 percent depleted, if experts are correct in estimating a half billion barrels ultimate production.

Texas of course retains the greatest punch among the states in flush producing capacity, particularly since some fair-sized fields have been appearing on the scene. But the natural decline of the older and more important fields, especially East Texas, has made the state much less dangerous than a few years back as a market menace.

All areas and states considered, it appears that the oil industry today has much less to fear than in recent past years from possible heavy overproduction of flush fields.

Prospects Are Optimistic

The partial lifting of the flush-field menace undoubtedly has been a contributing factor to increased optimism over the oil industry's prospects.

At the same time, some other circumstances within the industry also have tended to strengthen the oil markets and stabilize the business. Prominent among these favorable intra-industry factors is the unusually healthy statistical condition of the industry. The stocks of all oils are lowest for over eight years, and

supply currently is in fairly close conformity with demand.

Meanwhile, of course, the industry's prospects have been brightened materially by the generally improved business picture, particularly since the recovery movement has been featured by sharply higher sales of automobiles and trucks and greater demand for oils.

Earnings Best Since 1930

For the first nine months of 1935 the oil industry in general is indicated to have earned about one-third more profit than in the similar period last year. This statement is based on the results obtained by about a score of the leading companies in the industry. About the same degree of improvement is in prospect, also, for the full year as compared with last year.

The industry therefore will likely show the highest earnings since 1930. At the same time, the oil companies will be further extending improvement in earning power which has been steadily in progress during 1932, 1933, and 1934, as well as in 1935. This four-year, gradual improvement in earnings has followed the reaching of the depression bottom for the industry in 1931, when net losses were the rule rather than the exception.

Despite the four years of rising earnings, however, the industry's net income in 1935 probably will be around 25 percent smaller than in 1930. To recover the earning power of 1930, another year would be required at the rate of improvement which has occurred during 1935. In other words, extension of this year's rate of improvement through next year would expand earnings for 1936 to the proportions of 1930. Such further improvement during the coming year appears quite possible, in view of the industry's favorable statistical position and the general expectations of continued gains for industry as a whole in 1936.

Highlights of API Meeting

Following are some highlights of the American Petroleum Institute's annual meeting, held last week in Los Angeles:

Tax Reduction.—A determined campaign was launched toward reduction of gasoline taxes. Specific objectives include: (1) repeal of federal and municipal taxes, (2) reduction of all state taxes that are higher than three cents a gallon, and (3) prevention of diversion of state gasoline taxes from highway purposes.

Government.—The Institute's board of directors took a conspicuously "anti" stand toward governmental regulation of industry. Matters that the oil leaders are against include: (1) extension of federal control in state and local affairs, (2) current heavy federal expenditures, (3) government competition with private enterprise, (4) Congressional grants of authority to governmental executive departments, except within clearly defined limits.

Report Made on Oil Reserves

Highly important estimates and information on the nation's petroleum reserves were embodied in a preliminary report, prepared by special committees of the A.P.I. and submitted through the executive committee to the board of directors at Los Angeles. Early completion of the survey will bring up to date the Institute's survey of reserves made in 1925 and published in the volume, "American Petroleum—Supply and Demand." The new survey will revise estimates of reserves, forecast demand for the next 25 years, and broaden the scope of the original survey by including chapters on transportation, refining, marketing, taxation and labor.

Reserves and Demand Estimated

The present survey indicates that the nation will require 3,041,000 barrels of crude oil daily in 1950 and 2,926,000 barrels daily in 1960. It indicates that the nation has today 12,177,000,000 barrels of oil in proven underground reserves recoverable by present production methods. In addition, attention is called to likely discoveries of new fields and deeper pay sands, to increasingly efficient production and refining methods, and to vast potential reserves of oil that can be extracted from coal and oil-shales. The original report of 1925 indicated the coal and shales could supply the nation's requirements for centuries to come. The new report points out that England and Germany today are producing gasoline from coal and lignites at costs of 10 to 15 cents a gallon.

Report Weakens Control Cause

The figures and facts on reserves were set forth as a purely informative report by a committee of experts. But the contents of the report were seized upon by leaders in the industry and the A.P.I. as ammunition in the war against government regulation. The report helps to answer federal-control advocates who argue that regulation is needed to stave off an impending acute shortage of oil.

In this connection the Institute's president, Axtell J. Byles, stated in his annual address: "There seems no present reason to doubt that the industry will be able to provide this production of natural crude oil over the period indicated and no one now knows for how many decades thereafter. Should natural crude oil become not available in sufficient quantities, or at a competitive price, it would be gradually supplemented by production from bituminous coal and then, as we now foresee it, by production from oil-bearing shales. However, that time now seems more remote than it did a decade ago. Should that day come, the motor fuel obtainable from coal alone would be measured in hundreds of billions of barrels, while oil shales would yield an estimated potential production of 108,000,000,000 barrels of crude oil. The latter alone at the present rate of consumption should take care of our needs for a century."

Lowering of Taxes Sought

In urging the oil industry to launch a determined campaign for reduction of gasoline taxes, the A.P.I. proposes that filling station attendants be organized to carry the cause to the public. It is figured that pressure from an aroused public could force remedial legislation.

In the face of widespread publicity against excessive gasoline taxes, the levies have gone higher this year, and there has been increased diversion of the revenue from highway to general use. The taxes have reached such proportions that they are exerting appreciable retarding influence on gasoline consumption, even though such consumption is relatively high.

To combat this confiscation of their markets by the law makers, the oil companies clearly must do more than they have done so far.

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ROYALTY OWNER LIABLE FOR TAX ON HIS SHARE OF OIL

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The court pointed out that the university, of course, could not be required to pay tax on its share of the oil, as it is an agency of the state. The decision held, however, that this did not make the producer liable for the tax on the state's share of the oil.

It was pointed out that the legislature acted properly in holding all parties liable for the tax who were interested in the production. Under this theory the royalty owner could have readily been considered a producer, which the court held was reasonable legislation.

"We construe the act to levy the tax against the various interested holders in the oil produced, including the producer and royalty owners other than the university, in proportion to their respective interests . . . no greater burden is imposed on lessees on University lands than on other leases of privately owned lands . . . the act is valid and constitutional . . . the legislature may validly declare the owners of royalty interests to be engaged in the occupation of producing oil . . .

"There was no reason for providing that the tax be paid ratably by all interested parties if the legislature had intended to levy the tax against the producer only . . .

"The provision that the 'tax shall be the liability of the producer' does not mean that the tax is levied only against the producer . . . Nor is the provision that the tax be paid ratably by all interested parties in any manner affected by the provision for the payment of the tax by the producer or purchaser. The provision for a single payment is solely in the interest of the convenient and effective administration of the taxing act . . .

"Nor does the fact that the state or university is not liable for the tax levied against the royalty interest enlarge or change the tax liability of the lessee or producer of oil on university lands . . . (the operator) is only required to pay the proportion of the tax levied against it . . .

"The tax of two cents . . . is an occupation tax. We conclude that the legislature may reasonably impose the tax burden on those entitled to share in the gross receipts or profits of the oil enterprise . . ."

In the Cook case the court held invalid the contentions of the royalty owner that the law is improper because "it impairs antecedent obligations to deliver them one-eighth of the oil free of costs," and it violates a prior contract between royalty owner and producer through which the producer was to pay them the regular posted price for the oil.

". . . this act does not change in any manner the lease contracts. The tax is not against the oil royalty. It is levied as a gross production tax on the occupation of producing oil. The tax belongs to the state, and the mere fact that the producer is primarily liable for the payment of the tax, does not give him any interest in the tax as against the royalty interests.

"They (the producers) may have benefited by the change of legislative policy . . . but such legislative tax policy does not impair any obligation of the lease contracts . . ."

DEPTH RECORD

West Texas wildcat reported after mark

SAN ANGELO, TEXAS.

DEFINITE bid for the all-time record drilling depth is scheduled to be attempted by Humble Oil & Refining Company, according to reports, in continuing operations on its L. W. Pollok-Gulf 1, northeastern Upton County wildcat, in search of production from the Ordovician lime horizon. Drilling was in progress late last week at 11,055 feet, logging hard lime and chert formation, averaging about 10 feet daily with heavy duty rotary rig. It will likely displace a deep failure in Roumania which holds the depth record outside the United States by the end of the week as the fourth deepest drilled test in the world.

Approximately 1750 feet of additional hole must be negotiated by Humble Oil & Refining Company to attain the record depth honors now held by Gulf Production Company's J. T. McElroy 103, situated near the west line of Upton County. The latter was carried to 12,786 feet, or 1409 feet below the previous record, last May in an unsuccessful try for production in the Ellenberger, or lower section of the Ordovician lime series, which were encountered at 10,167 feet, with first Ellenberger limestone at 12,391 feet. The second deep test for Upton County is credited with having entered the Ordovician lime series at a lower level than the McElroy ranch project.

Gulf Production Company's W. N. Waddell et al 1, western Crane County wildcat, failed to yield oil or gas showings on drill stem test made in the Ordovician lime section at 6300-6360 feet, and had progressed to the 6414-foot level late last week. This well is the most important underway in West Texas, and is credited with having registered favorable oil saturation in recovered cores since entering the Ordovician zone at 6060 feet. However, drill stem tests have not been encouraging, but this absence of oil or gas in the formation testing tool may be due to the heavy rotary mud used to seal off prolific flow of sulphur water found in the Pennsylvanian lime. The entire section of Ordovician penetrated to date has been cored, then reamed to 9⅞-inch diameter hole. No casing has been set since the landing of 10¾-inch pipe near the 2400-foot level. It is reported that seven-inch pipe will be set at 6060 feet as soon as delivery can be made.

GENERAL COMMITTEE

Heads of A.P.I. Division of Production appointed

LOS ANGELES.

THE general committee of the division of production for the American Petroleum Institute for 1936 will be composed of the following men: O. D. Donnell, Ohio Oil Company; John M. Lovejoy, Seaboard Oil Company of California; Ralph B. Lloyd, Oil Producers Agency of California; J. Edgar Pew, Sun Oil Company; E. L. Smith, E. L. Smith Oil Company; A. M. Blow, Amerada Petroleum Corporation; P. H. Bohart, Gypsy Oil Company; Charles Bunje, Jr., Illinois Pipe Line Company; R. E. Collom, Continental Oil Company; C. P. Dimit, Phillips Petroleum Company; F. F. Hill, Union Oil Company of California; R. B. Kelly, Pure Oil Company; Clark H. Kountz, Sinclair Prairie Pipe Line Company; C. H. Lieb, Carter Oil Company; M. E. Lombardi, Standard Oil Company of California; W. L. McLaine, General Petroleum Corporation; T. V. Moore, Humble Oil & Refining Company; W. M. O'Connor, Atlantic Refining Company; R. Ogarrio, The Texas Company; R. B. Pringle, Tide Water Oil Company; F. O. Prior, Stanolind Oil & Gas Company; J. H. Russell, Gulf Production Company; D. R. Snow, Barnsdall Oil Company; H. R. Straight, Empire Companies, and T. E. Swigart, Shell Petroleum Corporation.

INTERSTATE COMPACT

LOS ANGELES.

GOVERNOR FRANK MERRIAM of California, November 14 pledged his support and that of his administration to the cause of an interstate oil compact.

Following a conference with E. O. Thompson, chairman of the Texas Railroad Commission, and Tom Anglin, representative of Governor E. W. Marland of Oklahoma, the California governor said he personally favored state regulation of oil conservation programs and that he would have a representative present at the next meeting of the Interstate Oil Company Commission.

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Meanwhile, of course, the industry's prospects have been brightened materially by the generally improved business picture, particularly since the recovery movement has been featured by sharply higher sales of automobiles and trucks and greater demand for oils.

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DEFINITE bid for the all-time record drilling depth is scheduled to be attempted by Humble Oil & Refining Company, according to reports, in continuing operations on its L. W. Pollok-Gulf 1, northeastern Upton County wildcat, in search of production from the Ordovician lime horizon. Drilling was in progress late last week at 11,055 feet, logging hard lime and chert formation, averaging about 10 feet daily with heavy duty rotary rig. It will likely displace a deep failure in Roumania which holds the depth record outside the United States by the end of the week as the fourth deepest drilled test in the world.

Approximately 1750 feet of additional hole must be negotiated by Humble Oil & Refining Company to attain the record depth honors now held by Gulf Production Company's J. T. McElroy 103, situated near the west line of Upton County. The latter was carried to 12,786 feet, or 1409 feet below the previous record, last May in an unsuccessful try for production in the Ellenberger, or lower section of the Ordovician lime series, which were encountered at 10,167 feet, with first Ellenberger limestone at 12,391 feet. The second deep test for Upton County is credited with having entered the Ordovician lime series at a lower level than the McElroy ranch project.

Gulf Production Company's W. N. Waddell et al 1, western Crane County wildcat, failed to yield oil or gas showings on drill stem test made in the Ordovician lime section at 6300-6360 feet, and had progressed to the 6414-foot level late last week. This well is the most important underway in West Texas, and is credited with having registered favorable oil saturation in recovered cores since entering the Ordovician zone at 6060 feet. However, drill stem tests have not been encouraging, but this absence of oil or gas in the formation testing tool may be due to the heavy rotary mud used to seal off prolific flow of sulphur water found in the Pennsylvanian lime. The entire section of Ordovician penetrated to date has been cored, then reamed to 9⅞-inch diameter hole. No casing has been set since the landing of 10¾-inch pipe near the 2400-foot level. It is reported that seven-inch pipe will be set at 6060 feet as soon as delivery can be made.

GENERAL COMMITTEE

Heads of A.P.I. Division of Production appointed

LOS ANGELES.

THE general committee of the division of production for the American Petroleum Institute for 1936 will be composed of the following men: O. D. Donnell, Ohio Oil Company; John M. Lovejoy, Seaboard Oil Company of California; Ralph B. Lloyd, Oil Producers Agency of California; J. Edgar Pew, Sun Oil Company; E. L. Smith, E. L. Smith Oil Company; A. M. Blow, Amerada Petroleum Corporation; P. H. Bohart, Gypsy Oil Company; Charles Bunje, Jr., Illinois Pipe Line Company; R. E. Collom, Continental Oil Company; C. P. Dimit, Phillips Petroleum Company; F. F. Hill, Union Oil Company of California; R. B. Kelly, Pure Oil Company; Clark H. Kountz, Sinclair Prairie Pipe Line Company; C. H. Lieb, Carter Oil Company; M. E. Lombardi, Standard Oil Company of California; W. L. McLaine, General Petroleum Corporation; T. V. Moore, Humble Oil & Refining Company; W. M. O'Connor, Atlantic Refining Company; R. Ogarrio, The Texas Company; R. B. Pringle, Tide Water Oil Company; F. O. Prior, Stanolind Oil & Gas Company; J. H. Russell, Gulf Production Company; D. R. Snow, Barnsdall Oil Company; H. R. Straight, Empire Companies, and T. E. Swigart, Shell Petroleum Corporation.

INTERSTATE COMPACT

LOS ANGELES.

GOVERNOR FRANK MERRIAM of California, November 14 pledged his support and that of his administration to the cause of an interstate oil compact.

Following a conference with E. O. Thompson, chairman of the Texas Railroad Commission, and Tom Anglin, representative of Governor E. W. Marland of Oklahoma, the California governor said he personally favored state regulation of oil conservation programs and that he would have a representative present at the next meeting of the Interstate Oil Company Commission.

New Trappage Theory

IDEA IS PRESENTED AT PACIFIC COAST GEOLOGICAL MEETING

LOS ANGELES.

THE twelfth annual convention of the Pacific Section, American Association of Petroleum Geologists, was held November 7 and 8 at the Mayfair Hotel, Los Angeles. The meeting was unusually successful both from the standpoint of attendance and of light thrown on controversial problems. Officers elected for the coming year are Chester Cassel of The Texas Company, president, and Richard Reese of Standard Oil Company of California, secretary-treasurer.

Particular interest was aroused by the paper "Time of Oil Migration and Accumulation," by A. I. Levorsen, national president, which contributes toward solving the problem of the presence or absence of commercial yields in similar traps. The application of this paper goes beyond its title in the sense that it brings system to phenomena previously appearing to be contradictory and without apparent explanation.

It has long been recognized that most oil beds remained essentially undisturbed and unfolded for many millions of years after being laid down, and that the structural traps which now yield petroleum were formed at a later time. Previous contributions to the problem of the concentration of oils have been in large part concerned with migrations taking place after the local traps were formed, it having been generally considered that hydrocarbons remained unconcentrated and more or less stagnant in their original disseminated condition during the long, quiet period before the folding, and began to move appreciably only after folding commenced.

The concept of Levorsen is that the oils start to move soon after they are formed, due to initial dip, compaction, and other causes. Regional tiltings further such movement. During the long, quiet period before folding occurs the disseminated oil particles migrate up dip, due to the differing gravity of oil and water, toward regional highs. These regional highs are usually, but not necessarily, the edge of basins. Various features, chiefly an overlapping of reservoir beds by later impervious shales or a lateral gradation of porous into non-porous material, cause much of the oil migrating up the regional dip to be finally arrested, and to be arranged as broad bands or lenses along the structurally high edge of the unfolded basins or in any part of the basins where obstacles to the regional migration occur.

At the close of the long, quiet period, the oils have therefore undergone a primary, regional segregation, and are broadly concentrated in the structurally high parts of basins. They are not yet localized to any great extent because of the lack of local traps.

Folding later occurs. In this subsequent folding local traps are formed, and the regionally concentrated oils move up the local dips into these, undergoing a secondary, more compact concentration into the local structures. Local traps which form in the area of primary regional accumulation tend to be most productive, while similar traps which form outside of this area tend to be less productive, thus explaining in part the barrenness of some structurally attractive anticlines and domes.

In some fields of the overlap type such as East Texas the primary segregation has remained the determining one, subsequent folding having merely modified the original concentration toward a basin's edge. Under the theory of early migration, protection from profound erosion and other causes of heavy leakage is seen to be of increased importance, for, if an original concentration either broad or local is lost, no amount of subsequent protection and time may be sufficient to allow of collecting a duplicate amount from the depleted source beds of the particular horizon. This latter feature further contributes toward an understanding of why many structural traps and even entire marine formations which are otherwise favorable are barren.

As one of allied phenomena the author shows that the outline of the accumulation at the East Texas field has moved northward in Quaternary time, and that the position of various other well-known accumulations has progressively shifted. Levorsen's paper throws light on so many hitherto obscure problems, and takes into consideration so many angles, that to baldly state its thesis does not do it justice. His evidence is peculiarly factual, with a minimum of unsupported theory. He compares different districts and conditions to indicate where different histories make the supposed primary segregation of more and of less importance.

R. D. Reed and J. S. Hollister presented a paper on the "Paleogeology of Southern California," giving preliminary data collected on the structural evolution of this area. Colored maps were used depicting the geology at various stages of the Mesozoic and Cenozoic. A progressive complication upward of structural features was outlined, with broad, early basins acquiring complex folding and faulting as a result of subsequent compression, chiefly in Pleistocene time. No important primary faults were recognized prior to this late epoch.

Albert Gregersen described the Cuyama fault, identifying this as part of a major system of fracturing which follows a contact between Mesozoic sediments and granites of related age across south-central California.

Frank B. Carter listed geologic features and problems of the Edison oil field, an accumulation due to overlap of Tertiary sediments on a schistose ridge. W. W. Valentine concluded that the recently discovered Semitropic gas field in San Joaquin Valley is yielding from sand lenses in lower Pleistocene clay.

John Galloway gave a paper on the accumulation of oil in the Coalinga district, which embraces Kettleman Hills. He presented evidence tending to show that the source of the known oils at Kettleman Hills is entirely Miocene instead of in large part Oligocene as some other workers have believed. W. H. Corey identified the lower, schist-bearing oil sand of the Playa del Rey field as being of upper Miocene age. J. M. Kirby described the geology of the Vacaville-Rumsey Hills area in middle California.

W. A. Clark reviewed existing ideas regarding pressures in oil and gas zones, including some effects of curtailment in California.

Shorter papers were presented by B. Gutenberg: "Velocities of Elastic Waves in Rocks of Various Ages and at Various Depths"; Donhuil Hillis: "A Colorimetric Method for Determination of Relative Saturation in Oil Sands"; W. P. Woodring, M. N. Bramlette, and R. M. Kleinpell: "Miocene Stratigraphy and Paleontology of the Palos Verdes Hills, California"; Graham B. Moody: "Unconformity Exposed in Santa Ana Mountains Foothills"; Parker D. Trask: "The Proportion of Organic Matter Transformed into Oil in the Santa Fe Springs Oil Field"; and J. Edmund Eaton: "Miocene of Caliente Range, California."

Richard C. Kerr gave an interesting account of work and experiences in Arabia, and Norman Hardy described equally strange adventures in Borneo.

The affiliated Pacific Section, Economic Paleontologists and Mineralogists, met the evening of November 7. W. F. Barbat and J. O. Nomland were elected respectively president and secretary. Earl H. Myers delivered a paper on "The Role of Foraminifera in Existing Oceans."

The annual dinner and dance of the association concluded the meeting.

HOT OIL DECISION

AUSTIN.

THE Texas Supreme Court has ruled that payment of penalties on "hot" oil does not legalize that oil for movement in commerce.

The court did not rule directly upon the question, but this was the effect of its action in refusing a writ of error in the case styled Skipper-Bivins Oil Co. vs. Railroad Commission.

By refusing the writ, the supreme court upheld the ruling in the decision handed down by the civil appeals court at El Paso.

In the opinion written by the appellate judges, they held that even though the penalty has been paid by the owner of over-produced oil, the owner is not entitled to deal in the excess production "the same as if it were a lawful object of commerce."

The oil company contended that, having paid the statutory penalties, it had obtained the right to sell the oil. The court, however, pointed out that no court had the right to require the railroad commission to issue tenders on the oil, which the commission had refused to do.

The opinion pointed out that such an action "would have the effect of nullifying the whole purpose of the conservation statutes. It cannot be said that the mere paying of the penalty for having produced the oil illegally would change its character and entitle the owner thereof to deal in it as he would in oil legally produced . . . Any loss which may occur (to the producer) appears to have been invited."

MEN IN THE INDUSTRY'S NEWS

CHAS. G. W. YOUNG, who is carrying on joint wildcat operations with J. P. Haley near Teague, Texas, was summoned to Rochester, New York, the past Week because of illness of a member of his family.

CAPTAIN H. J. WHITE, Anglo Saxon Petroleum Company, London, visited Palestine during October to be present at the inauguration of two new pipe lines constructed by the Royal Dutch Shell Company from Acre to Haiffa, Palestine.

S. F. SHAW, consulting engineer of the Westgate Oil Company, is constructing a gas-lift plant on the Cary lease in the Oklahoma City field.

W. S. S. RODGERS, president of The Texas Company, inspected properties of the company in the Gulf Coast, West Texas, and New Mexico en route Los Angeles, where he attended the annual meeting of the American Petroleum Institute.

I. W. ALCORN, for the past several years a sales engineer in the Tulsa district for Oil Well Supply Company, has resigned effective November 15 to become division engineer for Pure Oil Company at Houston, which will be his headquarters. Alcorn is a native of Marietta, Ohio, where Pure Oil Company originated, and a graduate of the Missouri School of Mines.

MARTIN W. STRONG, London, England, petroleum engineer with Anglo-Iranian Oil Company, is due to return to London shortly after having visited fields of the Mid-Continent and attending the annual meeting of the American Petroleum Institute in Los Angeles.

O. D. DONNELL, president of the Ohio Oil Company, and his son, John Donnell, were recent visitors in the offices of Marathon Oil Company, a subsidiary of the Ohio Oil Company. A tour of the Marathon properties in Oklahoma was made in company with Walter W. Fleming, president, and Frank R. Clark, president and chief geologist, respectively, for Marathon.

C. W. CLAYTON, chief clerk of the pipe line department of Mexican Gulf Oil Company at Tampico, is spending a vacation at his home in Illinois.

C. S. WORLEY, consulting engineer of the Consolidated Gas Utilities Company, is building a gas-lift plant for the Natural Gas Development Company in the Oklahoma City field.

DR. H. P. BYBEE, geologist in charge of the San Angelo field office of the University of Texas, mineral land division, was in Rochester, Indiana, the past week attending the funeral of his father, W. L. Bybee, who died November 5 after being seriously ill for several months.

PHILIP W. WRIGHT, production superintendent of Anglo-Iranian Oil Company who attended the annual meeting of the American Petroleum Institute in Los Angeles, plans to return to Iran soon.

DWIGHT M. ROSS, drilling contractor and independent producer of Wichita Falls, Texas, was a recent Tulsa business visitor.

FRANK GOUIN, well known southern Oklahoma geologist and independent operator, during the week appeared before the Tulsa Chapter of the American Petroleum Institute in a discussion of conditions in his portion of the state.

E. H. SALRIN, vice president, Tide Water Oil Company, Houston, returned from a business trip through the east during the past week.

JOHN W. CARTER, scout for Tide Water Oil Company, Houston, left for Pennsylvania to spend his vacation.

J. W. (RED) SELBY, chief scout for Shell Petroleum Corporation, Houston, made a business trip through the West Texas district during the past week.

A. L. ELLSWORTH of Toronto, Ontario, Canada, president of British American Oil Company, recently visited his company's holdings in the Turner Valley field.

F. O. YOUNG, manager of sales for National Tube Company, St. Louis, spent a portion of the week in Tulsa from which point he visited several Mid-Continent fields in company with local National Tube company representatives.

SIR EDWARD MOUNTAIN and M. L. C. Patterson have resigned from the board of directors of Mosul Oil Fields, Ltd., and British Oil Development Company in Iraq.

DR. GEORGE H. FANCHER, formerly chief petroleum engineer for New York Oil Corporation, Caney, Kansas, is the latest addition to the petroleum engineering staff of the University of Texas. Dr. Fancher, a graduate of the University of Southern California, with a master's degree from the University of Maryland and a Ph.D. from the University of Colorado, has taught petroleum engineering in the Colorado School of Mines and in the Pennsylvania State College. He is a member of the American Chemical Society, the American Petroleum Institute, and the Institution of Petroleum Technologists.

F. B. PLUMMER, professor at the University of Texas, was the speaker at the Houston Geological Society's weekly meeting November 14, discussing oil reservoirs.

R. B. PRINGLE, vice president, Tide Water Oil Company, spent a few days in Houston during the past week on a business trip.

RED FIDLER, of the Tide Water Oil Company, Houston, is vacationing in Tyler, Texas.

STANLEY GILL, consulting petroleum engineer, contemplates building a 20-room residence in Houston, according to announcement of a Houston architectural firm.

HOLT McWORKMAN, for the past five years in charge of sales in the West Texas division of the S. M. Jones Company, has been transferred to Tulsa as Tulsa district representative for the company with headquarters at 716 McBirney Building. Mr. McWorkman attended the Universities of Arkansas and Kansas, and has had wide experience with production problems and materials. He was for four years connected with one of the major operating companies, a connection which involved field experience in most of the fields of the Mid-Continent area. Mr. McWorkman will be succeeded in the West Texas division by J. R. "Jim" Hughes who studied petroleum engineering at the University of Tulsa and formerly was connected with one of the major companies. Hughes was transferred from Tulsa where he had been serving in the field engineering department of the S. M. Jones Company.

PAUL CORNELIUS, field representative for Sullivan Machinery Company, has returned to Tulsa after spending several months in the oil areas of the Gulf Coast.

E. F. SYBRANT, 77 years old, pioneer independent producer and drilling contractor, died at the home of a daughter in Tulsa on Tuesday, November 12. He was a native of Liona, Pennsylvania, and operated in fields of the east until 1912 when he came to Tulsa.

J. E. ("Mickey") O'CONNELL, head of the land department of Roeser-Pendleton, Inc., Fort Worth, has resigned to operate independently and to represent Eastern parties that plan to acquire production, lease and royalty interests. O'Connell has been connected with the above Fort Worth concern for the past eight years, and previously worked for the Sinclair Crude Oil Purchasing Company for a similar period.

D. E. LEGAN, superintendent of production, and T. A. Hall, engineer, Tide Water Oil Company, Houston, made a business trip through coastal Louisiana during the past week.

C. B. BARRETT, formerly manager of the Dallas district sales department of The Texas Company, has been transferred to Houston as manager of the latter district, succeeding S. E. Monroe, who has been assigned to other duties. Mr. Barrett will function under direction of J. S. Leach, sales manager of the southern territory for The Texas Company.

C. E. SUTTON, general manager of the Gulf Coast division for Pure Oil Company, Houston, is vacationing in California. He is expected to return around November 25.

V. G. LUND, geologist for The California Company, Houston, went on a business trip to California, November 15. He is expected to be gone two weeks.

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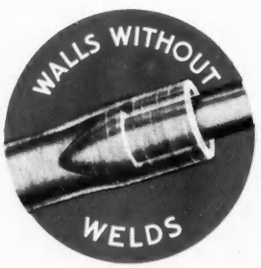

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Evaluation of Rotary-Drilling Lines

By K. N. SAATJIAN, The Texas Company, Los Angeles, California,
and
V. V. MASON, Standard Oil Company of California, La Habra, California.

THIS paper is sponsored by the American Petroleum Institute's Committee on the Standardization of Wire Rope and Manila Cordage, in an endeavor to develop a standard method for evaluating wire rope service. The authors present a formula, including an alignment chart for graphical solution, for determing the work done by drilling lines in terms of ton-miles. Tabular values of drill-pipe weights and similar variables are given, followed by a discussion of safety factors, line speed, loading, methods of attaching rope to drums, drum sizes, lubrication, etc. A chart shows graphically the service due to drill-pipe movements, while drilling; another chart provides a method whereby rotary-drilling lines may be retired from service as based on amount of wear and number of broken wires. A table is included showing a summary of operating conditions based upon replies to a questionnaire.

This paper was presented at the Sixteenth Annual Meeting, American Petroleum Institute, at Los Angeles, November 14, 1935. The statements and opinions expressed herein are those of the authors, and should not be construed as an official action or opinion of the Institute or of this magazine.

ROTARY-drilling lines have been developed, with respect to grade of material and construction, to such an extent as to assure reasonably uniform performance under normal operating conditions. And yet—mostly due to the extremely complex and variable nature of static and dynamic forces involved, and partly due to the lack of a uniform system of evaluating same—the available service records have been very erratic, and the results most inconsistent.

This subject is now being reviewed in order to correlate, if possible, the various forms now in use, and to recommend a uniform system for evaluating drilling-line service. It is not expected of course, that every wire-rope user will find it expedient to keep field-service records; neither do we believe it practical to formulate all the forces to which rotary-drilling lines are subjected in the course of drilling an oil well. All that it is hoped to accomplish is that, when and if service records are kept, standard forms will be followed in order that the information so obtained may permit reasonably fair comparison.

As a basis for this work, a questionnaire was forwarded to a representative group of wire-rope manufacturers and users. A summary of the questionnaire is appended hereto as Exhibit "A." In answering the questionnaire, practically all operators expressed a desire to have a uniform system established. It also became apparent that, with the exception of three operators who use "footage drilled" as a yardstick for evaluating the line service, all others keeping service records are using the Anderson ton-mile formula or a modified form thereof. We see no reason why "footage drilled" should not prove a suitable unit in drilling shallow wells in familiar territory, with standardized equipment and uniform drilling methods. Obviously, however, the system is inadequate to meet general drilling conditions.

The Anderson formula,‡ as introduced by H. H. Anderson, of Shell Oil Company, deals with static loads only. The work performed by the drilling line is expressed in formula (1), where:

n = number of stands.
l = length of one stand, feet.
L = length of string or depth of hole, feet.
w = weight of pipe per foot, pounds.
M = weight of traveling block, hook, links, elevator—pounds.
T.M. = ton-miles.

‡*A.P.I. Bull.* 7, vol. 9, Jan. 31, 1928; Proc. 8th Annual Meeting, Chicago, Ill., Dec. 1927.

$$\text{T.M. per round-trip} = \frac{(n + n^2)\,wl^2 + 4nlM}{5{,}280 \times 2{,}000}$$

or

$$= \frac{wL(l + L) + 4LM}{5{,}280 \times 2{,}000} \qquad (1)$$

By assigning the proper figures for weight and length and dividing by 2, the above formula will express the work done in setting casings.

The application of this formula and the underlying principles have been generally accepted by the industry, and any modification or simplification adopted or proposed by individual operators has been in the nature of assigning empirical values to certain indeterminate factors—or an attempt to simplify field and office work. It has been proposed by one operator, for instance, to substitute wL^2 for $wL(l + L)$ in formula (1). The change would assume that a full string of pipe is being handled as a unit. The assumption is contrary to actual field practice, and the result would reflect from one to

TABLE 1
Buoyancy

Pipe Size (Inches)	WEIGHT OF PIPE PER FOOT					LOSS OF PIPE WEIGHT	
	Atmosphere	Water (62.5-Lb.) (Pounds per Cubic Foot)	75-Lb. Fluid (Pounds per Cubic Foot)	100-Lb. Fluid (Pounds per Cubic Foot)	120-Lb. Fluid (Pounds per Cubic Foot)	Minimum (Percent)	Maximum (Percent)
2⅜	4.8– 6.6	4.5– 6.2	4.4– 6.1	4.3– 6.0	4.2– 5.8	6.3	12.8
2⅞	6.4–10.4	6.0– 9.7	5.9– 9.6	5.8– 9.4	5.7– 9.1	6.7	12.5
3½	8.5–13.3	8.0–12.5	7.8–12.3	7.6–12.0	7.5–11.7	5.9	12.0
4½	12.7–16.6	11.9–15.5	11.8–15.3	11.5–14.9	11.2–14.6	6.6	12.1
5 1/16	19.0–25.2	17.8–23.7	17.6–23.4	17.1–22.8	16.7–22.3	6.1	12.1
6⅝	22.2–31.9	20.8–29.9	20.5–29.5	20.0–28.7	19.5–28.1	6.3	12.1
7⅝	29.25	27.5	27	26.3	25.7	6.0	12.1
8⅝	40	37.5	37	36	35.2	6.2	12.0

10 percent greater ton-miles in favor of Anderson formula—depending upon the depth of the hole.

It is to be noted that the Anderson formula contains two elements subject to variation: *w*, the weight of pipe; and, *M*, the weight of traveling-block assembly. Some of the most important factors affecting these items, together with minimum and maximum limits, are as follows:

Buoyancy

Apparently a buoyancy factor is being used by several operators. When floating a casing in place, this factor becomes negligible. The drill pipe, however, loses six to 12 percent in weight—depending on the initial weight of drill pipe and the specific gravity of the fluid.

The effect of buoyancy is expressed in formula (2), where:

B = weight of drilling fluid per cubic foot.

$$\left.\begin{array}{l}\text{Weight of fluid displaced}\\ \text{by 1 lineal foot of pipe}\end{array}\right\} = \frac{3.53 \times w \times B}{1728} = 0.002wB \quad (2)$$

Formula (1), with buoyancy factor, thus becomes:

$$\frac{w(1 - 0.001 \times B)\,L(l + L) + 4LM}{5280 \times 2000} \quad (3)$$

Table 1 indicates the effect of buoyancy on drill pipe.

Tool Joints

The A.P.I. regular tool joints and corresponding size full-hole tool joints weigh practically the same; and, on the basis of two sets of tool joints per stand of drill pipe (90 feet) they add seven to 18 percent to the hook load—depending on the size and weight of drill pipe. The effect of tool joints on weight of pipe is indicated in Table 2.

Drill Collars

There seems to be no standard practice with respect to size and length of drill-collar assemblies; 60 to 180 feet will probably cover the field. In Table 3 are listed the average weights of drill collars and corresponding drill pipes. It is apparent from this list that drill collars will impose four to 17 ton-miles additional service on the line per round-trip.

TABLE 2
Tool Joints

TOOL JOINTS					
	Weight Average				
SIZE (Inches)	A.P.I. Regular (Pounds)	A.P.I. Full-Hole (Pounds)	Weight of Drill Pipe (Pounds Per Foot)	Weight of Couplings (Pounds)	Increase In Weight of Pipe per Foot Due to Tool Joints (Percent)
2⅜ x 16	23	...	4.80– 6.65	5.575	10.8– 7.7
2⅞ x 17	34	...	6.45–10.40	9.26	11.9– 7.3
3½ x 18	43	45	8.50–13.30	9.71	11.4– 7.2
4½ x 20	76	79	12.75–16.60	19.93	13.6–10.3
5 1/16 x 22	125	118	19.00–25.25	30.77	14.9–11.1
6⅝ x 24	165	160	22.20–31.90	36.58	16.8–11.7
7⅝ x 26	238	...	29.25	49.00	18.4
8⅝ x 28	324	...	40.00	70.8	18.4

Bits, Core Barrels, Reamers

In Table 4 are listed the approximate weights of cutting tools, reamers, etc. It is apparent from this list that two to four ton-miles of service per round-trip are added to drilling lines due to bits, etc.

Drill Stem, Swivel-and-Hose Assembly

As indicated in Table 5, drill stem, swivel-and-hose

TABLE 3
Drill Collars

DRILL COLLARS		DRILL PIPE		Difference in Weight per Foot of Drill Pipe and Drill Collar (Pounds)	ADDITIONAL WEIGHT DUE TO DRILL COLLARS		
Outside Diameter Times Inside Diameter (Inches)	Weight per Foot (Pounds)	Size (Inches)	Weight (Pounds per Foot)		60-Ft. (Pounds)	90-Ft. (Pounds)	180-Ft. (Pounds)
3¾ x 2⅛	25.5	2⅜–2⅞	4.8 –10.4	20.7–15.1	.....	1,863 1,359	3,726 2,718
5¼ x 3 1/2	53.6	3½–4½	8.5 –16.6	45.1–37.0	.....	4,059 3,330	8,118 6,660
7¾ x 5	93.6	5 1/16–6⅝	19.0 –31.9	74.6–61.7	4,476 3,702	6,714 5,553	13,428 11,106
10 x 5	200.3	7⅝–8⅝	29.25–40.0	171–160	10,260 9,600	15,390 14,400	.....

2,000-ft. hole—9,600-lb. to 15,390-lb. or 3.6 to 5.7 ton-miles per round-trip.
7,000-ft. hole—3,702-lb. to 13,428-lb. or 4.9 to 17.4 ton-miles per round-trip.
10,000-ft. hole—3,330-lb. to 8,118-lb. or 6.3 to 15.2 ton-miles per round-trip.

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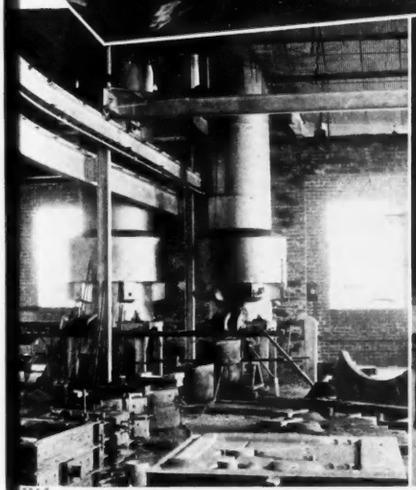

Views of Jensen factory, devoted exclusively to the production of Pumping Jacks and Units

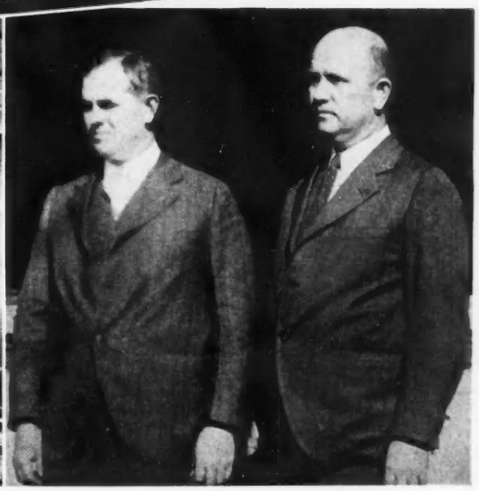

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TABLE 4
Bits, Core Barrels, Reamers

SIZE (Inches)	WEIGHTS				Depth of Hole (Feet)	Average Combined Weight (Tons)	Additional Ton-Miles Per Round-Trip
	Rock Bits (Pounds)	Fishtail Bits (28 In. to 48 In. Long) (Pounds)	Core Barrels (20 Ft. Long) (Pounds)	Reamers and Under-Reamers (Pounds)			
2⅞– 4¾	250	40– 80	350	100– 250	10,000	0.5	1.9
5⅝– 7	400– 700	80– 225	500– 700	300– 600	.....	...	...
7½– 9⅞	700–1,200	225– 300	675–1,000	600–1,200	.....	...	...
10⅝–12¼	1,300–1,800	300– 350	1,000–1,200	600–1,800	7,000	1.5	4.0
13¾–17	2,300–3,400	300– 500	1,200–1,900	1,800–2,000	.....	...	...
17½–27	4,000–7,000	500–1,000	1,900–3,000	2,500	2,000	5.0	3.8

assemblies add about five to 15 ton-miles *per hole* of 2000 to 10,000 feet.

It is further to be noted that, in the usual process of drilling, the entire string of pipe is lifted the length of the drill stem three times per stand, adding 23 to 274 ton-miles *per hole*—depending upon the depth and the size of pipe used. This factor is expressed in formula (4), where the average length of drill stem is assumed to be 45 feet or $\frac{l}{2}$:

$$\text{T.M. per hole} = \frac{3\,(n + n^2)\,wl \times \frac{l}{2}}{5280 \times 2000} = \frac{3}{2}\left(\frac{wl^2n + wln^2}{5280 \times 2000}\right) = \frac{3}{2}\left(\frac{wlL + wL^2}{5280 \times 2000}\right) \qquad (4)$$

Example:
2000 ft.—8⅝-in. 40-lb. drill pipe = 23.7 T.M.
7000 ft.—6⅝-in. 25.2-lb. drill pipe = 177.6 T.M.
12,000 ft.—3½-in. 13.3-lb. drill pipe = 274.0 T.M.

When drill-pipe sizes are changed during the life of a drilling line, formula (4-A) should be used, where:
L′ = depth of hole when pipe size was changed.

$$\frac{3}{2}\left(\frac{wlL + wL^2}{5280 \times 2000}\right) - \frac{3}{2}\left(\frac{5280 \times 2000}{wlL' + wL'^2}\right) = \frac{3wl}{2}\left(\frac{L - L' + \frac{L^2 - L'^2}{l}}{5280 \times 2000}\right) \qquad (4\text{-A})$$

Traveling-Block Assembly

This item affects the value of *M* in formula (1). And, as shown in Table 6, the combined weight of various parts of the assembly now in general use ranges from three to eight tons.

Service Chart

The limits of tangible static-load factors are summarized as follows:

Buoyancy removes six to 12.8 percent from weight of drill pipe.

Tool joints add seven to 18.4 percent to weight of drill pipe.

Drill collars add 3.6 to17.4 ton-miles per round-trip.

Bits, reamers, etc., add two to four ton-miles per round-trip.

Drill stem, swivel, hose, add five to 15-ton-miles *per hole.*

Drill-stem movements add 23 to 237 ton-miles *per hole.*

Traveling-block assembly three to eight tons.

It would seem that the bouyancy and the weight of the tool joints fairly compensate each other. These two items may, therefore, be eliminated from further consideration.

The combined effects of drill collar, bit and cutter assemblies, would add about 8.5 ton-miles per round-trip at a depth of 2000 feet; 15 ton-miles at 7000 feet; and 12.5 ton-miles at 10,000 feet. It is, therefore, assumed that 12 ton-miles per round-trip would be a

TABLE 5
Drill Stem, Swivel-and-Hose Assembly

DRILL STEM		Drill-Pipe Weight Per Foot (Pounds)	Additional Weight Due to Drill Stem, In:		Swivel	Hose	Average Combined Weight (Pounds)	Additional Ton-Miles Per Hole
SIZE (Sq. Ins.)	Weight per Foot (Pounds)		38 Ft. Length (Pounds)	54 Ft. Length (Pounds)				
2½	15.25	4.65	400	.....			.....	.....
3	25.6	10.4	580	.....			.....	....
3½	30.9	13.3	670	.....	2,300 lb. to 7,500 lb.	½ (300 lb. to 600 lb.)	.....	....
4¼	44.7	16.6	1,007	1,520			6,000	10.3
5¼	69.7	25.25	1,690	2,400			.....	....
6	89.7	31.90	2,200	3,120			.....	....
7	123.9	29.25	3,600	5,100			13,000	15 6
8	174.9	40.0	5,120	7,300			15,000	5.25

$$\text{2000-ft. hole—15,000 lb.} \frac{\frac{2000}{90} \times 3 \times 15{,}000 \times 54}{5280 \times 2000} + \frac{2 \times 15{,}000 \times 54}{5280 \times 2000} = 15.25 \text{ T.M. per hole.}$$

$$\text{7000-ft. hole—13,000 lb.} \frac{\frac{7000}{90} \times 3 \times 13{,}000 \times 54}{5280 \times 2000} + \frac{2 \times 13{,}000 \times 54}{5280 \times 2000} = 15.6 \text{ T.M. per hole.}$$

$$\text{10,000-ft. hole— 6000 lb.} \frac{10{,}000 \times 3 \times 6000 \times 54}{90 \times 5280 \times 2000} + \frac{2 \times 6000 \times 54}{5280 \times 2000} = 10.3 \text{ T.M. per hole.}$$

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FIGURE 1

reasonable constant to apply to all depths 2000 feet and over.

The combined effect of drill-stem assembly and drill-stem and pipe movements add about 30 ton-miles *per hole* at a depth of 2000 feet, and 285 ton-miles per hole at 12,000 feet.

Figure 2 shows ton-mile service due to drill-pipe movements at various depths. From a study of this figure it will be seen that down to 3000 feet this factor is so small that we believe it may be disregarded. Below 3000 feet, however, the ton-mile service increases at a fairly uniform rate—and it may be represented by taking 3½ percent of the footage drilled and adding same to the sum of wire-rope service. This item has, therefore, been provided for in the proposed "service-record" form.

The wide range of travelling-block assemblies now being used, and the corresponding effect on ton-mile service, would point to the necessity of changing the value of this factor to five tons in formula (1).

The service chart (Figure 4) is, therefore, based on the following revised formula:

$$\text{T.M. per round-trip} = \frac{wL(l + L) + 4LM}{5280 \times 2000} + 12 \qquad \text{(1-A)}$$

where $M = 10{,}000$ lb.

*A.P.I. *Standards No. 9-A: Specifications for Wire Rope.*

TABLE 6
Travelling-Block Assembly

PARTS	Weight (Pounds)	Average Combined Weights (Tons)
Travelling block	3,500–14,700 (including hooks)	3.0 (minimum)
Hooks	2,600– 4,500	8.0 (maximum)
Elevator links (set)	150– 900	....
Elevators	150– 600	....

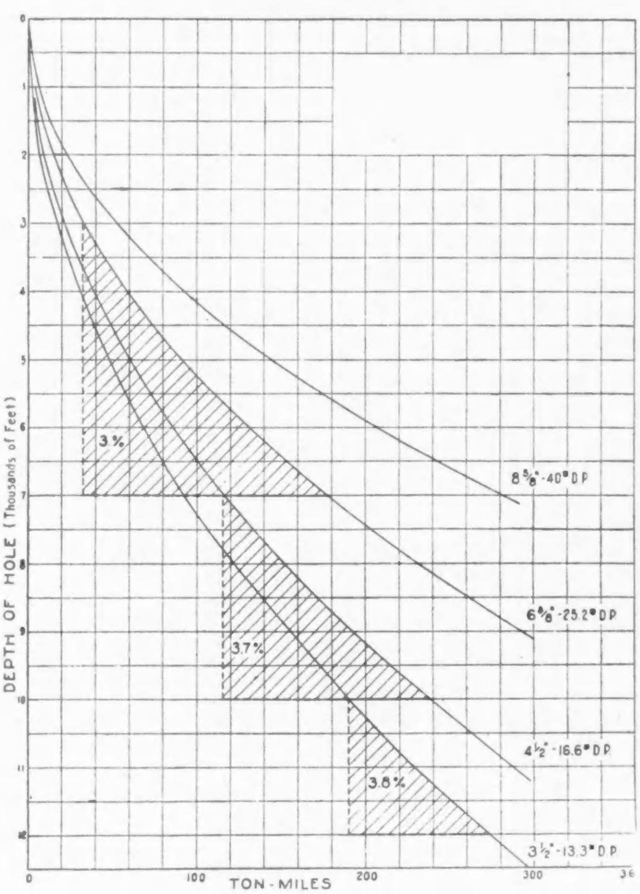
A recommended form for assembling the necessary field and office data is also given herein (Figure 1). This form is primarily intended for office use. It may be used equally well in the field, provided the individual operator has facilities for handling it. However, it has been our experience that, as a rule, clerical work of any nature is not very popular with most drilling crews. It would, therefore, seem more practical to note any pertinent information on the tour log.

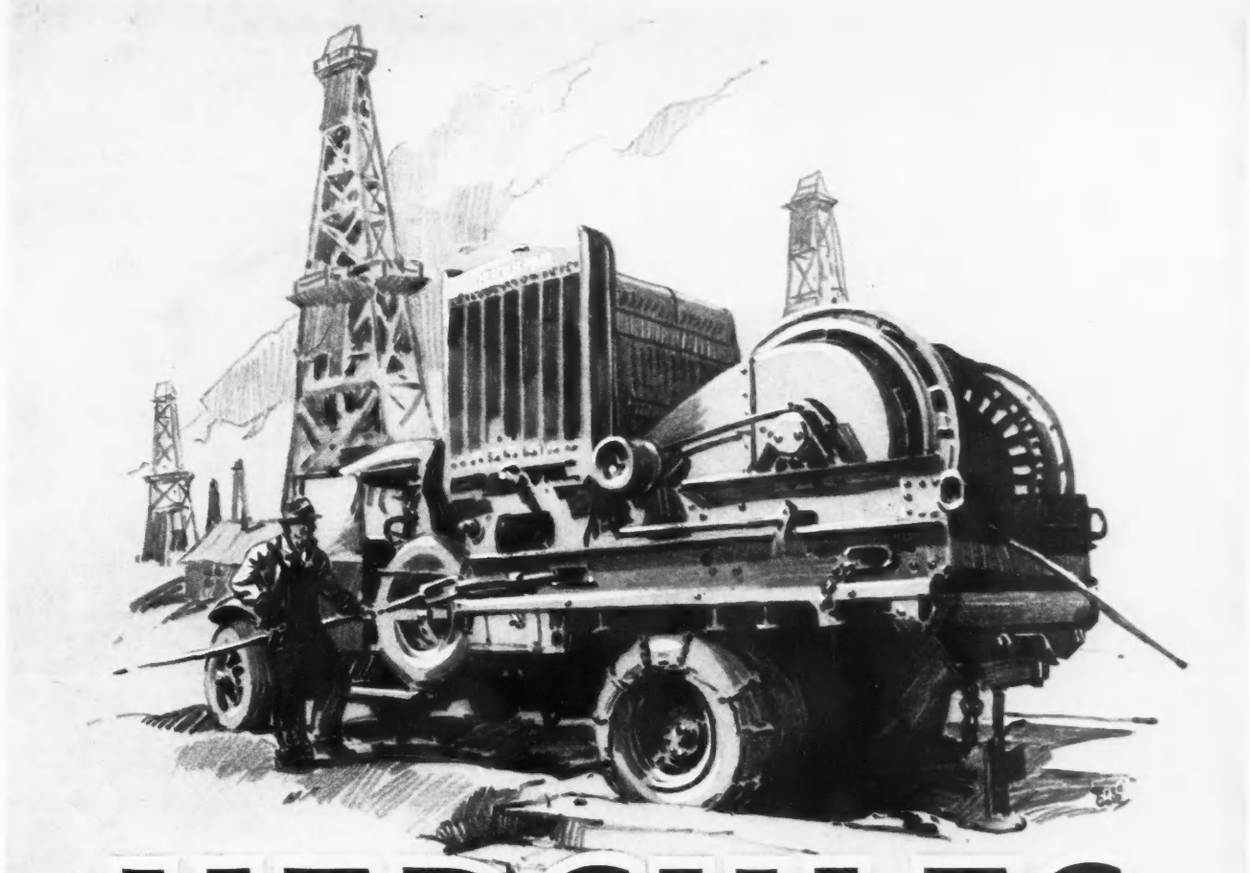
Retiring Drilling Lines

One of the most difficult problems in connection with drilling lines is the decision as to when the rope is to be retired. The answers to the questionnaire would indicate that the retirement of drilling line, in practically all cases, is left to the discretion of the tool pusher or driller in charge; and, evidently, the drillers and tool pushers are guided in their decision entirely by the appearance of the rope at the drum end with respect to the number of broken wires, amount of abrasion, and crushing. Obviously, the present practice permits too much latitude in the retirement of rope; and a more definite system, if at all practical, should prove beneficial, and should help to eliminate one uncertain factor from wire-rope service.

It is as essential to adopt a proper factor of safety for a new rope as it is to establish a minimum factor of safety below which it is not advisable to operate. Considering the risk involved, and conforming to initial safety factor of five as recommended by the American Petroleum Institute,* it is believed that the minimum factor of safety in drilling lines should not be permitted

FIGURE 2
Ton-Mile Service Due to Drill-Pipe Movements While Drilling.





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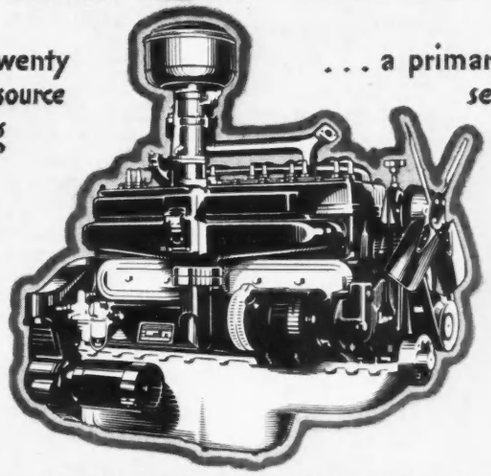

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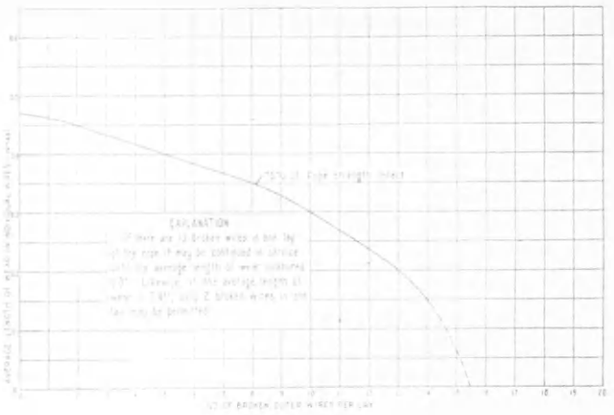

FIGURE 3
Permissible Length of Wear and Number of Broken Wires in 1 Inch, 6 x 19, 1-9-9, A.P.I. Grade "J," Regular Lay Hemp-Center Drilling Lines — Based on 3.75 Minimum Factor of Safety.

to fall below 3.75. In other words, at the time a drilling line is retired it should have no more than 25 percent of its initial rated breaking strength used up.

It is realized that in many instances, due to cold working in service, discarded drilling lines show greater breaking strength than new lines. Obviously, however, this factor is variable, and cannot be properly formulated; and considering, further, that additional strength is obtained at the expense of ductility, it is believed more practical to retire rotary-drilling lines on the basis of initial rated breaking strength, as provided in Figure 3.

Figure 3 indicates the relation between and the permissible combined effect of the number of broken wires per rope-lay and the total wear as represented by the average length of the worn surface on individual wires within one rope-lay. It is to be understood that this figure is predicated on broken wires being fairly evenly distributed over the six strands—and not concentrated in any one strand. This figure applies to one-inch A.P.I. grade "J," 6 x 19, 1-9-9, Seale construction, regular lay, hemp-center lines only; and the values shown are based on actual tests conducted and information assembled by several wire-rope manufacturers. Similar figures could be prepared for other sizes and for other constructions.

Corrosion, as a factor in the retirement of drilling lines, is being disregarded—as corrosion cannot be properly appraised, and in most instances it can be controlled.

It is further assumed that normally all abrasion and breakage occurs in the outer wires; and that error, in measuring length of wear, due to distortion of wire will be on the side of safety.

There are a large number of dynamic forces and other indeterminate stresses created by mechanical peculiarities of equipment used that cannot be properly appraised without considerable research and expense; and, even then, it appears very doubtful whether the result will prove of practical benefit, or whether such data could be incorporated in a single formula.

Line Speed

From available information, the rotary-drilling lines are operating at speeds of 2000 to 6500 feet per minute. It is believed, however, that the recommended setting of 4000 feet per minute as maximum speed with existing drum condition, as contained in Paragraph A-31, Appendix "A," A.P.I. Standards No. 9-A, is still a satisfactory rule to follow.

Line Loading

It is important to note that the factor of safety of five, as recommended in Paragraph A-32, A.P.I. Standards No. 9-A, should be applied to the fast line in which is accumulated the frictional forces of all sheaves and internal rope friction. The rated breaking strength of one-inch grade "J," 6 x 19, 1-9-9 line pipe, for instance, is 73,000 pounds. With a factor of safety of five, the permissible line stress would be 14,600 pounds—or, in a six-line string-up, a permissible load capacity of 87,600 pounds. However, this load will create in excess of 16,400 pounds stress in the fast line, reducing the factor of safety to 4.45.

Retaining the safety factor of five in the fast line, the load-carrying capacity of the system would be reduced from 87,600 pounds to 77,660 pounds—a reduction of

TABLE 7
Allowable Drill-Pipe Lengths

Line Size		1-IN.				1⅛-IN.				1¼-IN.			
Lines Up		6	8	10	12	6	8	10	12	6	8	10	12
Maximum line load, lbs.		77,660	99,200	119,600	137,800	95,800	122,200	147,500	170,000	120,000	153,500	185,000	213,000
Maximum dr.ll-pipe load, lbs.		47,660	69,200	89,600	107,800	65,800	92,200	117,500	140,000	90,000	123,500	155,000	183,000
(INCHES) Drill-Pipe Size and Weight	Weight of Drill Pipe (Lbs. per Feet, with Couplings)	FEET				FEET				FEET			
8⅝	40	1,191	1,730	2,240	2,695	1,645	2,305	2,937	3,500	2,250	3,087	3,875	4,575
7⅝	29.25	1,629	2,365	3,063	3,685	2,249	3,152	4,017	4,786	3,076	4,222	5,299	6,256
6⅝	31.9	1,494	2,169	2,808	3,379	2,062	2,890	3,683	4,388	2,821	3,871	4,858	5,736
	25.2	1,891	2,746	3,555	4,277	2,611	3,658	4,662	5,555	3,571	4,900	6,150	7,261
	22.2	2,146	3,117	4,036	4,855	2,963	4,153	5,292	6,306	4,054	5,563	6,981	8,243
5⅝	25.2	1,891	2,746	3 555	4,277	2,611	3,658	4,662	5,555	.....	.....	.....	.....
	22.2	2,146	3,117	4,036	4,855	2,963	4,153	5,292	6,306	.....	.....	.....	.....
	19.0	2,508	3,642	4,715	5,673	3,463	4,852	6,184	7,368	4,736	6,500	8,157	9,631
	16.6	2,871	4,168	5,397	6,493	3,963	5,554	7,078	8,433	5,421	7,439	9,337	11,024
4½	13.75	3,466	5,032	6,516	7,840	4,785	6,705	8,545	10,181	6,545	8,981	11,272	13,309
	12.75	3,738	5,427	7,027	8,454	5,160	7,231	9,215	10,980	7,058	9,686	12,156	14,352
	13.3	3,583	5,203	6,736	8,105	4,947	6,932	8,834	10,526	6,766	9,285	11,654	13,759
3½	11.2	4,255	6,178	8,000	9,625	5,875	8,232	10,491	12,500	8,035	11,026	13,839	16,339
	8.5	5,607	8,141	10,541	12,682	7,741	10,847	13,823	16,470	10,588	14,529	18,235	21,529

Note—Maximum load capacity of 1-in., 1⅛ in., and 1¼-in. line with factor of safety of 5, 14,600 lb., 18,000 lb., and 22,600 lb., respectively. 30,000 lb., estimated average weight of drill collars, drill stem, and travelling-block assemblies deducted from maximum line loads to obtain maximum drill-pipe loads.

over 10 percent, or the equivalent of 355 feet of 6⅝-inch pipe.

The correction factor used in securing the above figures was based on the result of research data accumulated by several wire-rope manufacturers.

Table 7 indicates permissible loads and corresponding lengths of pipe, with various numbers of lines up, retaining a factor of safety of five.

Attaching Wire Rope to Drum

So far as wire-rope service is concerned, there has been very little, if any, difficulty experienced due to manner of attaching wire rope to the drum. The many plans outlined in the questionnaire have proved reasonably satisfactory. The prevailing practice of tying a knot at the end of the line does have some detrimental effect on the rope, but it is believed that any distortion thus created does not work up through the dead wraps, carried on the drum, into the live line. In most cases the line is damaged by loss of lay due to improper seizing before tying the knot, rather than the manner of securing the rope to the drum. The ideal device, it would seem, should be easy to handle, light in weight, and the least injurious to the rope. It is hoped that a more uniform and more satisfactory practice will develop from research work now being carried on by several operators and manufacturers.

Dead Rope on the Drum

The prevailing trend, as indicated in the questionnaire, is towards grooved-drum construction—the majority now in use being 25-inch diameter with pronounced tendency for 30-inch and 32-inch on new purchases.

Obviously, a minimum amount of dead rope should be carried on the drum, and it should be sufficient to develop the full strength of the line without pulling out. Experience and research have demonstrated that on 25-inch diameter, and larger, grooved drums five to eight wraps of 1¼-inch (or smaller) rope at point of pick up will be adequate.

It is also apparent that nearly half of the operators answering the questionnaire are using plain-faced drums ranging in diameter from 10-inch to 24-inch. In such instances the problem is not so much of rope pulling out as it is that of proper spooling. And, under normal conditions, one complete layer and two to three wraps should be sufficient. Necessity for an additional two to three wraps arises from the face that for smooth spooling the rope must not strike the spool flange at the point of acceleration.

Cutting Lines

It is apparent from the questionnaire that the practice of cutting lines is far from being uniform. Some do not cut lines at all; others cut four feet, 20 feet, 25 feet, 30 to 50 feet, 150 feet, and 300 feet at a time.

Line cuts are made either to move forward the stress point on the line where the same contacts the dead sheave, or to change the turn-back point on the rope at the hoist drum, or to eliminate the crushed or used portion of rope. The stress area at the dead sheave is usually confined to not more than four feet. The turn-

FIGURE 4

Chart Showing Ton-Miles Per Round Trip, Pipe Weight Per Foot, and Depth (thousands of feet), for Wire Rope Service.

EXHIBIT "A"

SUMMARY OF ANSWERS TO QUESTIONNAIRE ON ROTARY-DRILLING LINES

Oil Operator.	Keep Service Records.	System Used.	Drum Size, Grooved or Plain.	Sheaves—Size.		Dead Rope on Drum.	Cut Lines.	When Line Retired?	Line Size.	How Line Attached to Drum.	Interested in Standard Form.	Remarks and Recommendations.
				Crown Block.	Traveling Block.							
1	Yes.	Anderson's modified.	26 in. grooved.	42 in.	36 in.	10 to 13 wraps at pick up. Smooth drum, 1 layer and 3 wraps.	20 ft. to 30 ft. each drilling week.	Check wear, broken wire and crushing. Reverse ends.	1 in.	Through flange, taper clamp, and "U" bolts. or Through flange loop and two clips.	Yes.	Crown-block sheaves be mounted on central pin, allowing lines to be spooled by continuous threading from crown block to travelling block to eliminate kinking.
2	Yes.	Anderson's.	20 in. plain.	24 in. to 32 in.	32 in.	6 wraps minimum.	Drillers' judgment.	Drillers' judgment.	1 in. and 1⅛ in.	Through flange, around shaft and clamp.	Yes.	—
3	No.	—	14 in. plain.	24 in.	30 in.	1 layer.	Seldom. Handle light loads.	Drillers' judgment.	1 in.	Through flange and two clamps.	Yes.	—
4	Yes.	Anderson's simplified.	26 in. grooved.	46 in.	36 in.	7 to 37 wraps.	Drillers' judgment. Best to cut 4 ft. from drum end every few days, also cut several hundred feet or reverse ends.	Drillers' judgment. Final diameter 0.95 in. +	1 in.	Through flange, around shaft, and "U" bolt cable clamps.	Yes.	Correlate methods used by various companies.
5	Occasional.	Anderson's simplified.	18 in. to 30 in. grooved.	36 in. to 42 in.	36 in. to 42 in.	½ to ¾ layer at pick up.	25 ft. to 50 ft. when necessary.	Drillers' judgment.	1 in. and 1⅛ in.	Through flange, taper clamp, and "U" bolts or zinc-in socket.	Yes.	Simplify calculation—provide a common yardstick. All factors can not be evaluated.
6	No.	—	25 in. grooved.	31⅛ in.	31⅛ in.	1 layer.	No.	When first strand breaks.	1 in.	Wire-rope clips.	Yes.	Anderson's formula valuable, but too complicated.
7	No.	—	25 in. grooved.	20 in. to 27 in.	30 in.	1½ layers.	30 ft. every 7 drilling days, also reverse ends.	Broken wires in strands.	1 in.	Through flange, loop, and clamp.	Yes.	—
8	Yes.	Anderson's modified.	14 in. to 32 in. new drums grooved.	36 in. and 42 in.	36 in. and 42 in.	1 layer and 3 wraps.	Seldom. Use short lines except on wildcats.	Drillers' judgment.	1 in. and 1⅛ in.	Through flange and three wire-rope clips.	Possibly.	—
9	Yes.	Anderson's	14 in. to 15 in. plain.	24 in. old. 36 in. new.	36 in.	1 layer.	No definite practice.	Drillers' judgment.	1 in.	Through flange and two to three wire-rope clips.	Yes.	—
10	Yes.	Footage drilled.	10 in. to 18 in. plain.	20 in. to 26 in.	18 in. and 26 in.	10 wraps at pick up.	Drillers' judgment.	Drillers' judgment.	¾ in., ⅞ in., 1 in.	Through flange, loop, and a clip.	Yes.	Shallow drilling—1,500 ft. average. Line spooler takes whip out of line. Even flow of power and prevention of spring hooks bouncing when empty will decrease wear. Use wire-line lubricator.
11	Not lately.	Ton-miles.	16 in. to 18 in. plain.	28 in. to 34 in.	36 in	1 layer	Seldom. Change ends.	Drillers' judgment.	1 in.	Through flange and two to three wire clips.	Yes.	—
12	Yes.	Anderson's.	24 in. plain	36 in.	36 in.	1½ to 2 layers.	—	Drillers' judgment.	1 in.	Through flange, loop, and clamp.	Yes.	Make graphs for evaluating ton-mile for drill pipe and casings, and make same available at nominal fee.
13	Yes.	Anderson's.	20 in. plain. 30 in. grooved	48 in	30 in.	1 layer and 4 wraps.	One cut of 300 ft. when wickering appears	Normally line not used for more than 2 round-trips after it develops wickering at the drum when travelling block is in raised position.	1 in., 1⅛ in., 1¼ in.	Prefer attaching line to drum by babbit-filled socket.	Yes.	Ton-mile service decreases as average stress increases. Pooling of selected wire-line data, without disclosing the brand, might lead to correction factors and improvement in construction.
14	Yes	Footage drilled.	26 in. grooved.	48 in.	48 in.	1 layer.	No	When strands start breaking.	1⅛ in. (1,350 ft.)	Through flange, loop, and clamp.	No?	—
15	Occasional.	Ton-miles.	25 in. to 30 in. grooved.	36 in. and 46 in.	36 in	½ to 1 layer	30 ft. after every fifth trip (deep holes).	Drillers' judgment.	1 in., 1¼ in.	Through flange, loop, and clips; also through flange, taper, clamp and "U" bolts.	Yes.	—
16	Occasional.	Anderson's.	18 in. to 24 in. grooved preferred.	36 in. and 46 in.	36 in.	1¼ to 1½ layers.	Drillers' judgment.	Drillers' judgment.	1 in., 1⅛ in., (1,400 ft.)	Through flange, loop, and two clips.	Yes.	A committee determine constants, prepare graphs, and make forms available to all.
17	No.	—	32 in. grooved.	36 in.	36 in.	1 full wrap.	Do not cut.	Drillers' judgment.	1⅛ in.	Patented clamp through drum flange.	Yes.	—
18	Occasional.	Ton-miles.	20 in. plain.	42 in.	30 in.	—	50 ft. to 150 ft. every 10 days.	Drillers' judgment.	1 in., 1⅛ in.	Through flange, loop, and clip.	Yes.	—
19	Yes.	Footage drilled.	15 in. plain.	22 in.	24 in.	1 layer and 6 wraps.	Broken wires. Cut enough to change stress points on drum and sheaves.	Broken wires or line too short.	1 in.	Two clips in unison with bolt.	Yes.	—

back point on the drum may be changed by cutting or advancing forward 15 to 20 feet of rope, while general wear and fatigue conditions necessitate longer cuts. Change of stress points is usually accomplished by adding one to two wraps on the drum every few days—especially when handling heavier loads at greater depths—until several hundred feet shall have accumulated, and then the cut is made.

There is undoubtedly an economic relation between the length of drilling line and number of cuts. Stringing a new line usually requires two to four hours, and cutting a line will require about one hour. Assuming $25 per hour for rig time and 25 cents per foot for drilling line, one 2500-foot line may be cut two to four times as against two 1250-foot lines without cutting.

Some operators apparently reverse the drilling line end to end in order to distribute the wear and, also, to utilize the section of the line from the dead end to the dead sheave which could not otherwise be brought into active service. The available data are insufficient to prove or disprove the economic value of this practice.

The minimum lengths of drilling lines with six, eight, and 10 lines, in 122- and 136-foot derricks, with 36-inch travelling and 46-inch crown-block sheaves and 60 feet of dead rope on the drums, are approximately as follows:

122-Ft. Derrick:

(Lines)	(Feet)
6	1120
8	1340
10	1660
12	1870

136-Ft. Derrick:

(Lines)	(Feet)
6	1230
8	1530
10	1830
12	2060

The selection of the proper length of drilling lines necessarily rests with individual operators. It would seem, however, that drilling lines ordered in multiples of 250 feet, as stipulated in A.P.I. specifications,* should work no hardship on wire-rope users; and the practice, if followed, should reflect an additional saving to both consumers and manufacturers.

The following lengths are apparently now being used:

(Feet)
1200 to 1350
1400 to 1500
1700 to 1750
2000 to 2250-2500
3000

Drum and Sheave Sizes

The rotary drums, crown- and travelling-block sheaves now in use cover a wide variety of sizes. The sheaves, in general, and the drums, in particular, are much smaller than the minimum 30-inch diameter stipulated by the Institute.

The drum and sheave sizes (in inches) now in use are summarized as follows:

Drums—10, 14, 15, 16, 18, 20, 24, 25, 30, 32.

Crown-Block Sheaves—20, 22, 24, 26, 27, 28, 31, 32, 34, 36, 42, 46, 48.

Travelling Blocks—18, 24, 26, 30, 31, 32, 34, 36, 42, 48.

The questionnaire indicates a definite tendency toward 30-inch and 32-inch diameter grooved drums. The brake problem and limitation in the width of drum face would make it appear that not much more increase in drum diameter should, for the present at least, be expected. It is well to bear in mind that in order to derive the full benefit of grooving, a minimum amount of dead rope should be carried on the drum—as the guiding effect of grooving is at its minimum in the third wrap.

The prevailing crown-block-sheave diameters are 36 inches to 46 inches. The sheave diameter is limited by the water-table opening; and, therefore, for the present at least, the maximum diameter will not possibly exceed 60 inches. It is believed that one of the most detrimental factors on wire rope has been the lower-deck small-diameter sheave being used for the dead line—in most instances 26-inch diameter. Several operators have eliminated the small sheave by substituting a large sheave in the upper deck, with very beneficial results.

Insofar as wire-rope service is concerned, the travelling-block sheaves need not be dealt with differently from the crown blocks—and the same limiting factors apply.

The main difficulty with practically all manganese-steel crown- and travelling-block sheaves in the past has been that, due to difficulty in machining this material, the grooves were trued up with hand-grinding equipment—resulting in sheaves being out-of-round, wabbly, and irregular. These conditions have proved highly detrimental to the line under present loading conditions and hoisting speeds.

Lubrication [1] [2]

In general, all rotary-drilling lines at the present time are laid up with a good grade of lubricant in the core, and very little difficulty is being experienced due to lack of lubrication of internal wire.

Wire-rope service is primarily a function of metallic area; and, therefore, any practical method that will retard the abrasion on the outside wires will undoubtedly extend the life of the rope.

The mechanics of application of a lubricant is a problem for the individual operator. The important fact remains, however, that the lubricant should be of good grade, and should be applied frequently.

Summary

The Anderson T.M. formula is basically sound, and remains intact. However, the value of M in this formula has been increased to meet recent developments in heavier equipment. A constant has been added to compensate the combined effects of the weights of drill collars and cutting assemblies. A factor based on footage drilled has been provided to compensate for movements of the main string of drill pipe as the result of assembling a stand. A simplified ton-mile chart (Figure 4) as developed by H. Schnoor, of the Standard Oil Company of California, has been further revised to conform to changes made in the formula. This form has the added advantage over the present T.M. curves in that it may be readily used for any weight of pipe at any depth, within the limits of the chart.

A chart has been provided for retiring rotary-drilling lines which, it is believed, will prove of practical value.

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[1] A. J. Moran, "Lubrication of Wire Rope," *Penn. State Col. Tech. Bull. 18.*

[2] "Rules and Regulations for Metal Mines," *Bur. Mines Bull. 75*, Govt. Printing Office (1915).

A.P.I. Standards No. 9-A: Specifications for Wire Rope.

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Energy Relations In a Flowing Well

By B. H. SAGE and W. N. LACEY
California Institute of Technology,
Pasadena, California

IN any attack upon the problems presented by the flow of fluids through pipes or porous media, a knowledge of the properties of the fluids involved is a primary requisite. In the case of fluids whose properties undergo large changes during the flowing process, these properties must be known over the ranges of conditions which may be encountered in practice.

The properties whose values must be measured for this purpose will depend upon the method of attack upon the problem. One method which offers some promise in dealing with the complicated case of the flow of complex mixtures of naturally-occurring hydrocarbons involves the use of those fundamental energy relations which are dealt with in thermodynamics. Properties which appear to be most useful in this connection are specific volume, heat content and entropy; and they must be known as functions of temperature and pressure throughout the range of conditions likely to be met in field practice. These three properties are well known to engineers dealing with steam-power equipment, compressors, and refrigeration machinery. The work of these men is predicated upon a knowledge of the values of these properties, for the fluids with which they deal, resulting from experimental determinations. The time-tried and practically-tested benefits of this method of study can be utilized by the petroleum-production engineer to equal advantage if he has available the results of the proper experimental measurements upon those materials in which he is particularly interested. His situation, however, is complicated by the great variations of composition of these materials, requiring a much greater volume of information than is needed to deal with single or pure substances.

It is the purpose of this paper to present some experimental results for a particular case, and to indicate how they may be used to analyze the energy relations involved in flow through the tubing of a producing well. The necessary steps in the investigation include field measurements and procurement of suitable samples, laboratory measurements upon the samples thus obtained, and the necessary calculations based upon both sets of measurements. The field measurements and the sampling for this paper have been carried out through the courtesy of the technical and research department of the Humble Oil and Refining Company under the supervision of T. V. Moore and R. J. Schilthuis. The laboratory studies and calculations have been prosecuted as a part of the work of Research Project 37 of the American Petroleum Institute.

This paper was presented at the American Petroleum Institute, Sixteenth Annual Meeting, Los Angeles, November 11-14, 1935.

THE problem of procuring a representative sample of the fluid flowing in the well is not an easy one. One possible method is to take depth or sub-surface samples near the bottom of the well, while another is to obtain the samples at the other end of the system, viz., at the surface. The first method, depth sampling, requires special equipment and technique, and to a certain extent interferes with normal production operations. One of the least satisfactory features, however, is the great difficulty of designing a sampling device which will obtain a representative and useful sample from a mechanical mixture of gas and liquid phases, unless such a mixture is a very intimate one. It is difficult to visualize a practicable device which will not in many instances fill itself more or less selectively with one or the other of the two phases. If this occurs, the sample is almost sure to tell a story which is somewhat misleading. The great advantage of the depth-sampling method is that, if the sample can be correctly taken, it furnishes directly the material needed for the laboratory study. It must be remembered, however, that if composition of the fluid varies when flow conditions are varied, samples must be obtained and studied for each set of flow conditions. The most favorable situation for obtaining representative depth samples would be found in the case of a well in which conditions were such that the material flowing consisted, at the point of sampling, of but one phase, viz., only liquid or only gas. Under such circumstances the sample obtained should be representative, and would also serve for varying flow conditions, so long as there was only one phase at the point of sampling.

The method which involves the taking of samples at the surface requires little equipment of an elaborate character, and need not disturb operating conditions. It consists of taking samples from each stream of material being produced at the well head and of obtaining as accurate as possible a measure of the quantity of material in each stream. For example, in the case of a well flowing to a high-pressure trap, thence to a low-

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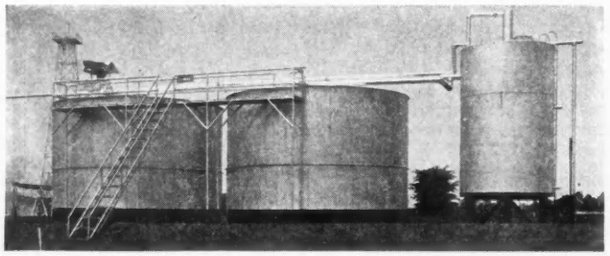

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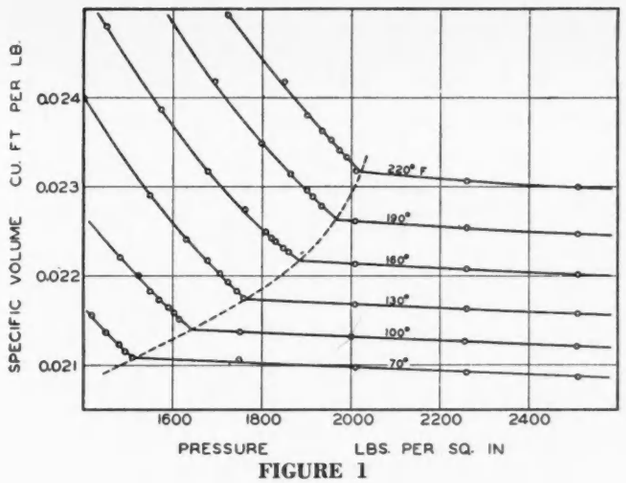

FIGURE 1

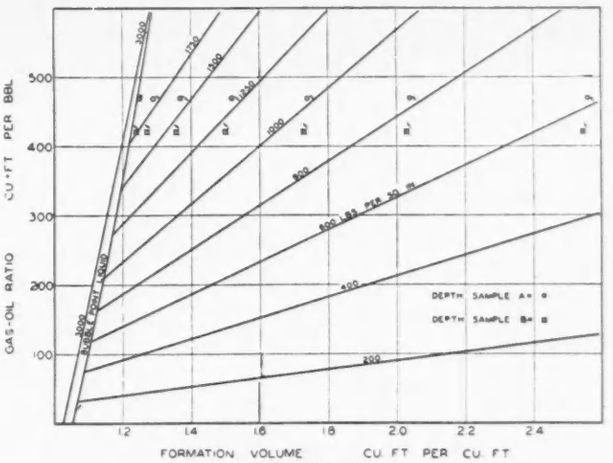

FIGURE 3

pressure trap, and finally to a vent tank, one would obtain, perhaps, samples of gas from each of the traps and from the vent tank, together with an oil sample from the vent tank, the corresponding rates of production of each material being measured. Another one of the possibilities would be to sample the liquid and the gas from the high-pressure trap and measure the corresponding production rates. In each case the most desirable points of sampling would have to be decided upon on the basis of existing conditions. The next step in this method of sampling requires the re-blending of the different materials sampled, in the correct proportions to build a composite mixture representative of the entire fluid, efflux from the tubing. This step does require special equipment for careful measurement of fluid quantities (either for liquids or gases) and for forcing these measured amounts quantitatively into a suitable common container for mixing, but this blending can be carried out in the laboratory at any subsequent time. One advantage of the method is that a blend of the gases can be made, and this blended-gas sample can be added to the liquid sample in different proportions corresponding to various gas-oil ratios likely to be encountered over ordinary ranges of production conditions. Such a procedure involves the assumption that the composition of gas and oil will not be greatly altered with changing gas-oil ratio or changing production conditions, an assumption whose validity may be tested experimentally. It is unlikely that this assumption holds rigorously, but there is a possibility that the deviations for moderate variations of gas-oil ratio would not prove to be serious from an engineering viewpoint.

Samples used in the present study were obtained in both of the two ways discussed above. The wells sampled were in the Conroe field in Texas, and previous experience indicated that the fluid entered the wells as a single liquid phase with no free gas. This situation furnished an opportunity for comparing results of the two sampling methods, under conditions favorable for depth sampling, to ascertain whether or not the surface-sampling method would produce material whose properties were in agreement with that found near the well bottom.

The well* from which the depth samples were obtained had a total depth of 5170 feet, with the top of the sand at 5122 feet. Seven-inch casing was set at 5140 feet, with five-inch screen from 5135 feet to 5168 feet. The tubing was 2½-inch with upset end, with bottom at 5156 feet. The elevation of the well was 187 feet above sea level. Samples were taken at an approximate depth of 4600 feet, with the well flowing. It was necessary to obtain the samples several hundred feet off bottom in order to avoid contamination with wash water left in the wells after drilling. There was some evidence that the depth samples used were slightly deficient in gaseous constituents to be completely representative. It was felt by the authors that this effect was not large enough to be detrimental, since the analyses and gas-oil ratios were based upon the samples as used.

The surface samples of gas and oil were taken from a well† operated with a single trap, both samples being removed from this trap at a pressure of 28 pounds per square inch, gage, and at a temperature of 68°F. Analyses of these two samples, together with those of the depth samples, are shown in Table 1.

Pressure-volume-temperature studies[1] were made

TABLE 1
Microfractional Analysis

Component	Surface Samples		Depth Samples	
	Gas	Oil	"A"	"B"
Inert*	0.48	....	....	....
Methane	78.28	0.05	4.86	4.44
Ethane	10.00	0.11	1.20	1.07
Carbon dioxide	0.50	....	....	....
Propane	5.63	0.46	1.39	1.27
*Iso*butane	1.50	0.45	0.59	0.50
*n*Butane	1.65	0.65	0.81	0.82
Pentane	1.96	1.63	1.48	1.38
Heavier	....	96.65	89.67	90.51
Total	100.00	100.00	100.00	100.00
Molecular weight: Heavier fraction	184		172	
Vapor pressure: Heavier fraction	30 mm mercury at 80 deg. F.		35 mm. mercury at 78 deg. F.	

*Air, calculated from oxygen determination.

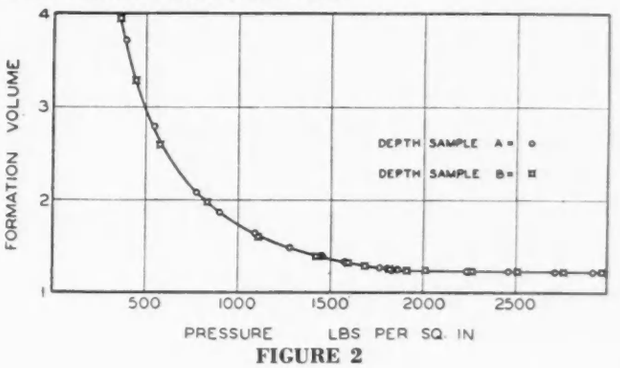

FIGURE 2

*Humble Oil & Refining Company's "South Texas Development Co. No. 8."
†Humble Oil & Refining Co.'s "H. N. Moore No. 18."

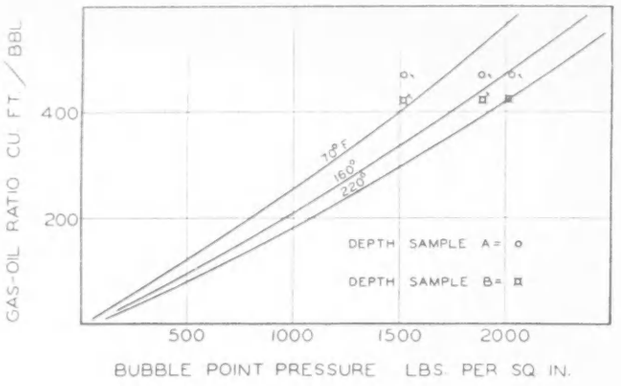

FIGURE 4

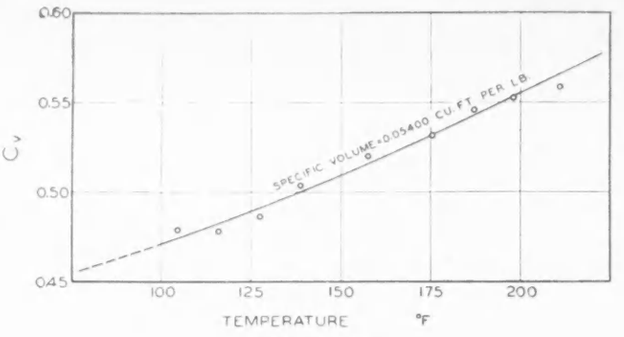

FIGURE 5

upon the two depth samples. Figure 1 illustrates the experimental data obtained. It shows values for the volume, in cubic feet, accupied by one pound of depth sample "A" when brought to equilibrium at a series of temperatures and throughout a limited range of pressures, below and above bubble point. Bubble point is that condition in which all but an infinitesimal amount of the gas is dissolved in the liquid phase. At pressures higher than that for bubble point, at the temperature in question, the sample would be completely liquid; while at slightly lower pressures, a gas phase would be in equilibrium with the liquid. In the curve drawn through the experimental points for a given temperature, the break point corresponds to bubble-point condition of the sample. A comparison of results for the two depth samples for a temperature of 160°F. and for the range of pressures studied is shown in Figure 2. In this case the volume data are expressed in terms of formation volume, which is the volume in cubic feet occupied by the whole sample, at the specified equilibrium temperature and pressure, per cubic foot of residual oil corrected to 60°F. and a pressure of 14.73 pounds per square inch. The gas-oil ratios for this purpose were computed for separation of gas at 68°F. and at a pressure of 28 pounds per square inch, gage, in order to correspond to the surface samples.

TABLE 2

Formation Volumes for a Mixture of Conroe Surface Samples

(Having a Gas-Oil Ratio of 102.6 Cu. Ft. Per Bbl.); p=pressure, in lb. per sq. in., absolute; p_B=bubble-point pressure, in lb. per sq. in., absolute; formation volumes, in cu. ft. of mixture under specified conditions per sq. ft. of oil is measured at 60 deg. F. and at 14.73 lb. per sq. in., absolute.

p	70 Deg. F. (p_B=438)	100 Deg. F. (p_B=475)	130 Deg. F. (p_B=512)	160 Deg. F. (p_B=550)	190 Deg. F. (p_B=590)	220 Deg. F. (p_B=632)
Bubble point	1.036	1.056	1.077	1.098	1.121	1.144
200	1.580	1.734	1.890	2.043	2.196	2.351
300	1.228	1.317	1.408	1.497	1.589	1.678
400	1.068	1.132	1.199	1.264	1.327	1.394
500	1.035	1.056	1.087	1.138	1.192	1.246
600	1.034	1.055	1.075	1.097	1.121	1.168
800	1.033	1.053	1.073	1.094	1.116	1.139
1,000	1.031	1.050	1.070	1.091	1.112	1.135
1,500	1.027	1.046	1.066	1.086	1.106	1.127
2,000	1.024	1.042	1.061	1.080	1.100	1.121
2,500	1.021	1.039	1.057	1.076	1.095	1.115
3,000	1.018	1.035	1.052	1.070	1.089	1.109

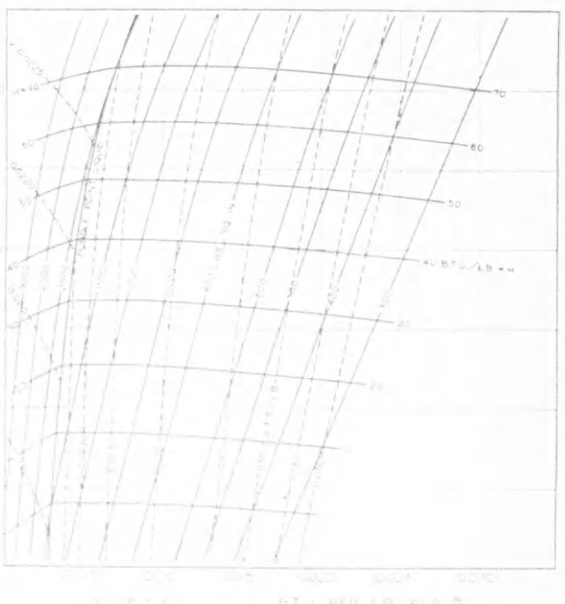

FIGURE 6

Pressure-volume-temperature measurements were also made upon mixtures of surface gas with surface oil, thus giving samples with two different gas-oil ratios. The results of this study are presented in Tables 2 and 3.

Using these values for 160°F. in conjunction with similar values for the surface-oil sample alone and a number of single values for other mixtures obtained for the purpose, a diagram showing formation volume of mixtures of surface samples, for this temperature of 160°F., as a function of gas-oil ratio of the mixture and for a series of pressures, was constructed. This diagram is shown in Figure 3. In it are located points corresponding to the formation volumes found for each of the depth samples at each of the different pressures. It will be seen that the surface-sample curves predict reasonably well the formation volume of a given depth sample when its gas-oil ratio is known. It is believed

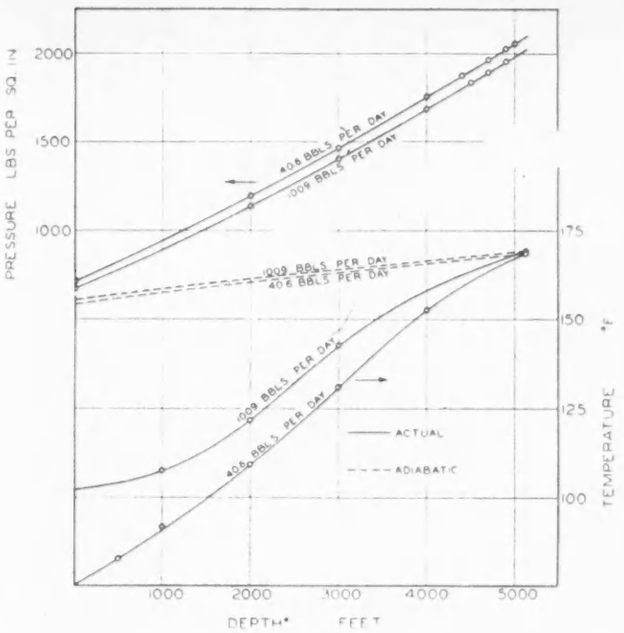

FIGURE 7

that the agreement is within the uncertainty of the depth method. Figure 4 shows the solubility values obtained at three different temperatures from the surface-

changes of entropy with change of pressure at any one temperature are small compared to the changes of entropy with change of temperature. This results in a diagram in which the lines or contours of constant pressure are grouped so closely together as to make accurate interpolation difficult. To avoid this difficulty, entropy **(s)** itself has not been used as a coordinate, but instead a function of entropy (viz., $s - 0.0008(t - 60)$, where t is the temperature in °F.) has been utilized. In order to obtain an entropy value from the figure, the corresponding value of the abscissa is read off. To this value is added $0.0008(t - 60)$ for the temperature in question, and the result is the entropy value. For example, it is desired to obtain from Figure 6 the entropy of one pound of depth sample "A" when brought to equilibrium at a temperature of 150°F. and at a pressure of 1000 pounds per square inch, absolute. First the intersection of the lines for 150°F. and 1000 pounds per square inch pressure is located. The corresponding reading of the abscissa is found by dropping vertically to the lower coordinate axis, giving $s - 0.0008(t - 60) = 0.011$. Substituting 150 for t, s is found to be $0.011 + 0.072 = 0.083$ B.t.u. per pound per °F., absolute. For this same condition the corresponding value of heat content is found by interpolation between lines of constant heat content. In this case the intersection previously located lies between lines corresponding to $H = 30$ B.t.u. per pound and $H = 40$ B.t.u. per pound. Interpolation gives $H = 38.7$ B.t.u. per pound for the specified condition of the sample. Similarly, the value of specific vol-

TABLE 3

Formation Volumes for a Mixture of Conroe Surface Samples

(Having a Gas-Oil Ratio of 442.5 Cu. Ft. Per Bbl.); p=pressure, in lb. per sq. in., absolute; p_B=bubble-point pressure, in lb. per sq. in., absolute; formation volumes, in cu. ft. of mixture under specified conditions per cu. ft. of oil is measured at 60 deg. F. and at 14.73 lb. per sq. in., absolute.

p	70 Deg. F. (p_B=1,642)	100 Deg. F. (p_B=1,732)	130 Deg. F. (p_B=1,818)	160 Deg. F. (p_B=1,905)	190 Deg. F. (p_B=1,992)	220 Deg. F. (p_B=2,079)
Bubble point	1.167	1.187	1.209	1.232	1.258	1.286
400	2.799	3.036	3.277	3.518	3.758	3.998
600	2.027	2.183	2.339	2.499	2.655	2.812
800	1.635	1.752	1.873	1.993	2.114	2.236
1,000	1.406	1.506	1.606	1.705	1.803	1.901
1,250	1.250	1.335	1.417	1.500	1.584	1.666
1,500	1.171	1.232	1.296	1.360	1.426	1.489
1,750	1.165	1.187	1.221	1.273	1.324	1.372
2,000	1.162	1.183	1.206	1.230	1.255	1.299
2,500	1.156	1.178	1.200	1.223	1.248	1.276
3,000	1.152	1.173	1.194	1.216	1.240	1.268

sample study. Again the corresponding points for the two depth samples are shown for comparison.

In order to determine the energy relations during flow in the well, one more set of measurements was needed in addition to the pressure-volume-temperature study. These measurements were made upon depth sample "A." They consisted of determination of the specific heat of the sample throughout the temperature range from 70°F. to 220°F. The specific heat was measured[2] with the sample maintained at constant volume. The experimental results obtained are shown in Figure 5. Calculations based upon the curve shown in this figure and P-V-T results for depth sample "A" presented in Table 4 gave the values of heat content and entropy also shown in this table. The methods used in these calculations have been described elsewhere.[1-2]

From these data there has been constructed a temperature-entropy diagram for depth sample "A." This diagram is shown in Figure 6. For this material, as in the case of many found in production practice, the

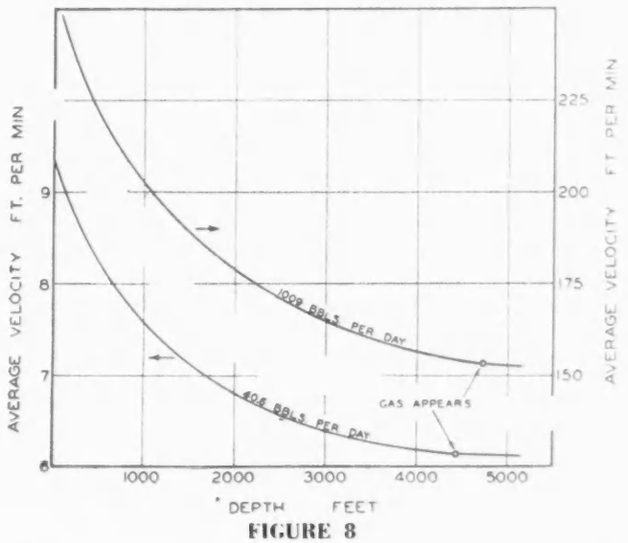

FIGURE 8

ENGINEERED FOR ACCURACY

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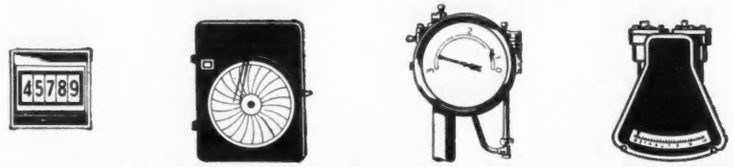

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TABLE 4

Thermodynamic Properties of Conroe Depth Sample

Gas-oil ratio, 470 cu. ft. per bbl.
p=pressure, in lb. per sq. in., absolute.
v=specific volume, in cu. ft. per lb.
s=entropy in B.t.u. per lb. per deg. F., absolute.

Mass per cent of gas, 8.8 per cent.
p_B=bubble-point pressure, in lb. per sq. in., absolute.
h=heat content, in B.t.u. per lb.

p	70 Deg. F. (p_B=1,513)			100 Deg. F. (p_B=1,643)			130 Deg. F. (p_B=1,768)			160 Deg. F. (p_B=1,881)			190 Deg. F. (p_B=1,965)			220 Deg. F. (p_B=2,025)		
	v	h	s	v	h	s	v	h	s	v	h	s	v	h	s	v	h	s
Bubble point	0.02109	—0.05	0.01095	0.02140	13.74	0.03539	0.02175	28.37	0.05992	0.02218	43.87	0.08474	0.02265	60.35	0.11019	0.02316	77.76	0.13598
300	0.06700	1.24	0.02664	0.07228	15.72	0.05328	0.07828	30.98	0.07982	0.08512	47.01	0.10635	0.09292	63.65	0.13280	0.10128	81.50	0.15943
400	0.05155	0.86	0.02396	0.05535	15.17	0.05021	0.05979	30.24	0.07642	0.06470	46.07	0.10262	0.06990	62.75	0.12886	0.07510	80.30	0.15528
500	0.04230	0.57	0.02178	0.04563	14.76	0.04791	0.04920	29.70	0.07381	0.05292	45.43	0.09984	0.05673	62.03	0.12598	0.06070	79.51	0.15229
600	0.03650	0.34	0.01998	0.03928	14.44	0.04594	0.04228	29.31	0.07173	0.04545	44.97	0.09763	0.04855	61.51	0.12370	0.05168	78.95	0.14994
700	0.03238	0.17	0.01845	0.03478	14.20	0.04429	0.03728	29.01	0.06998	0.04000	44.62	0.09579	0.04280	61.12	0.12180	0.04560	78.54	0.14800
800	0.02940	0.04	0.01713	0.03150	14.01	0.04286	0.03375	28.77	0.06847	0.03612	44.34	0.09421	0.03858	60.82	0.12017	0.04102	78.22	0.14633
1,000	0.02550	—0.10	0.01495	0.02716	13.77	0.04049	0.02900	28.45	0.06596	0.03086	43.95	0.09159	0.03269	60.39	0.11749	0.03467	77.76	0.14363
1,250	0.02288	—0.13	0.01279	0.02406	13.65	0.03818	0.02544	28.26	0.06352	0.02694	43.72	0.08905	0.02840	60.12	0.11491	0.02978	77.48	0.14104
1,500	0.02115	—0.05	0.01103	0.02211	13.68	0.03631	0.02326	28.24	0.06159	0.02445	43.68	0.08706	0.02565	60.07	0.11296	0.02678	77.43	0.13902
1,750	0.02104	0.62	0.01046	0.02137	14.02	0.03513	0.02180	28.36	0.06002	0.02275	43.77	0.08546	0.02370	60.16	0.11134	0.02465	77.51	0.13741
2,000	0.02100	1.33	0.00996	0.02132	14.70	0.03456	0.02170	28.95	0.05932	0.02212	44.14	0.08439	0.02261	60.42	0.11008	0.02329	77.74	0.13609
2,250	0.02094	2.05	0.00948	0.02127	15.38	0.03401	0.02164	29.59	0.05870	0.02206	44.73	0.08369	0.02255	60.95	0.10927	0.02308	78.17	0.13516
2,500	0.02088	2.77	0.00900	0.02121	16.07	0.03349	0.02158	30.24	0.05811	0.02200	45.34	0.08301	0.02247	61.49	0.10850	0.02300	78.64	0.13428
2,750	0.02084	3.49	0.00854	0.02116	16.77	0.03298	0.02152	30.90	0.05754	0.02194	45.95	0.08236	0.02240	62.04	0.10775	0.02293	79.12	0.13342
3,000	0.02080	4.21	0.00808	0.02112	17.47	0.03248	0.02147	31.56	0.05698	0.02188	46.57	0.08171	0.02234	62.60	0.10701	0.02286	79.60	0.13257

ume (V), found by interpolation from the diagram, is 0.0304 cubic feet per pound of sample. The values of heat content and entropy given in Table 4 and Figure 6 are based upon the arbitrary datum value of zero for each of these properties at 60°F. and at a pressure of 3000 pounds per square inch.

To utilize this information in analyzing flow of this mixture (depth sample "A") through the flow string of a well, one must know the temperatures and pressures at various depths in the tubing. This information can be obtained in the field by taking temperature and pressure readings at a series of depths while the well is allowed to flow at a given rate. Two such sets of field measurements for the well from which the depth samples were taken are shown in Figure 7. Solid-line curves have been drawn through the measured points to give the distribution of values of temperature and pressure within the tubing as functions of depth for each of the two rates of flow.

The average linear velocity of the fluid as it travels up the tubing can be calculated from the P-V-T data and the field information in Figure 7. Curves for the two flow rates, based upon the data for depth sample "A," are shown in Figure 8. Although the fluid in the tubing consists only of liquid near the bottom of the well, it will be seen that free gas would be expected to appear before any great distance had been traversed.

Calculations by methods previously described[3] gave values for the heat lost to the surroundings as the fluid rises and for the energy involved in frictional effects during the flow. These calculations were based upon the thermodynamic data for depth sample "A," upon the field data from Figure 7, and upon the assumptions that the flowing system was operating in a steady state with regard to time, and that equilibrium was maintained between gaseous and liquid phases in contact. From Figure 7 the values of pressure and temperature corresponding to a series of positions in the tubing were read. From this information the values of heat content and entropy for each position were ascertained from the thermodynamic data for depth sample "A." A point in the tubing at a depth of 5122 feet below surface, corresponding in elevation to the top of the sand, was chosen as the reference point from which to calculate energy changes. For each chosen position in the tubing the heat lost to the surroundings by one pound of fluid in flowing to that position from the reference point is calculated by determining the difference in heat contents at the reference point and at the chosen position and subtracting therefrom the energy per pound of fluid required to accomplish the change in elevation involved. By plotting these values against depth of the chosen position for each of the two rates of flow, the solid curves of Figure 9 were obtained. Next the entropy values for the chosen positions were plotted against the corresponding absolute temperatures. By graphical methods, the area under this curve between the entropy for the reference point and that for the chosen position was determined. This area represents a negative quantity of energy, which is equal to the energy involved in frictional effects minus the heat lost to the surroundings during the flow from the reference point to the chosen position. The latter quantity is known from the previous calculation, and thus the energy dissipation due to friction may be found. By determining this quantity for each of the chosen positions, the data for preparing the dashed-line curves of Figure 9 were obtained. The frictional effects, as here used, include not only friction due to flow past the walls and friction due to slippage and turbulence within the fluid itself, but all other irreversible processes occurring within the system.

In changing the elevation of the fluid from a level equal to that of the top of the sand to the surface, the useful work done amounts to 5122 foot-pounds per pound of fluid, or 6.59 B.t.u. per pound. In comparison to this utilized energy, Figure 9 shows that, in the case of flow at the rate of 40.6 barrels of surface oil per day, 40.0 B.t.u. per pound is lost in the form of heat transmitted through the tubing walls to the surroundings, and 0.3 B.t.u. per pound is dissipated in frictional effects. In the case of flow at the rate of 1009 barrels per day, the work of elevating one pound of well fluid remains the same; but the energy lost through the tubing as heat is 28.0 B.t.u. per pound, and the frictional effects involve 1.0 B.t.u. per pound. It was found in both cases that the energy required to increase the velocity of the flowing fluid from the bottom to the top of the tubing was negligible compared to the other energy quantities. Thus, in spite of the fact that the frictional effects at the greater rate are approximately three times as great as those in the slower flow, the energy residual in the fluid as it reaches the surface is greater, as a result of

lower heat loss. It is true, of course, that this residual energy is valueless unless steps are taken to utilize it.

To further illustrate the large influence of heat losses to the surroundings, dashed curves corresponding to each of the two rates of flow are shown in Figure 7 to indicate the temperature distribution in the tubing if no heat losses were permitted.

It should be remembered in the interpretation of these results that, as stated above, the composition of depth sample "A" used in the experimental work may have been a little different from that actually flowing at the time the field measurements were made. Furthermore, it must be clearly understood that the relation between energy quantities and rate of flow for this case of a well in which the entering fluid is all in the liquid state would not be expected to hold true for the more general case when both gas and liquid are entering the bottom of the flow string and when the gas-oil ratio is likely to vary with rate of production. The present discussion is limited to consideration of energy relations within the tubing, and does not concern itself with the effective utilization of reservoir energy.

Conclusions

It has been shown that information obtained from suitable surface samples will permit the prediction, with satisfactory accuracy, of the volume properties of depth-liquid samples for the case when no free gas is present in the well at the point of sampling.

The large temperature change during the flow process here considered is due primarily to conduction of heat through the tubing wall to the surroundings, and only a small fraction of this change results from changes in state of the fluid, as is indicated by the dotted-line curves of Figure 7.

In the particular case studied, the dissipation of energy as the result of frictional effects is a minor factor in the energy changes occurring during the flow through the tubing, even for rates of flow greater than the maximum here reported.

Acknowledgments

This work was carried out as part of the studies being made upon hydrocarbon behavior by Research Project 37 of the American Petroleum Institute. Thanks are due the Institute for interest and support.

The authors wish to express their great indebtedness to those members of the technical and research department of the Humble Oil & Refining Company who cooperated so cordially in this investigation.

J. E. Sherborne and H. S. Backus assisted materially in the experimental determinations.

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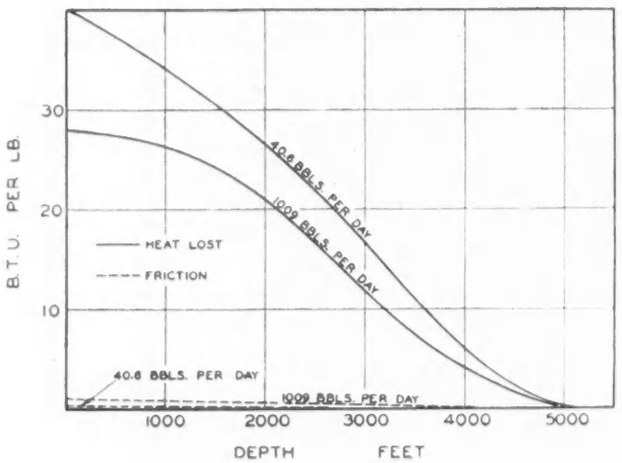


FIGURE 9

Economics of Pumping

By BRUCE H. ROBINSON
General Petroleum Corporation of California
Los Angeles

IN the absence of curtailment, protection against drainage dictates a policy of pumping at the maximum practical rate; while under curtailment, which is generally based upon potential, ability to demonstrate potential is unfortunately obligatory. Fortunately for ultimate recovery, maximum practical pumping rates are generally less than drastically-curtailed flowing rates were during the early life of the field. Moreover, during the late life of a well, maximum pumping rate increases ultimate recovery by postponing abandonment.

A. Maximum Production

1. *Pump Depth*—Lowering tubing always tends to increase production, although there are wells with bad pipe and wells in which troublesome sand conditions are aggravated by increased depth—and in such cases the benefits of deep tubing cannot be realized.

One of the latest tools of the production man is the bottom-hole pressure gage, which makes it possible to evaluate the effect of deep tubing in advance of trial. With the pressure gage, productivity factors are determined. "Productivity factor" is defined as the number of barrels per day that are produced per pound differential pressure between the formation and the well. Factors range from 0.1 barrel up to about 10 barrels per pound of differential. Oil of 30 degrees A.P.I. exerts a pressure of 38 pounds per square inch for each 100 feet of fluid column, so that each reduction of the fluid level by 100 feet will tend to increase production as follows:

Minimum rate of increase 38x0.1=3.8 bbl. per day
Maximum rate of increase 38x10=380 bbl. per day

As an actual example, in a Los Angeles Basin well the tubing was lowered from 4,576 feet to 4,606 feet. Production increased from 20 barrels per day to 80 barrels per day, a high return for the cost of 30 feet of tubing and rods.

In addition to the direct advantage of deep tubing, lowering will occasionally place the pump below oil froth. Froths are common in the more viscous oils; and, although more unusual, may also be found in wells producing higher gravities. Frothey oil is rarely found near the bottom of a well, but may occur higher up. One of the deeper wells at Santa Fe Springs gave considerable pump trouble and small production at first. Tubing was fairly close to bottom; and, although various combinations of pumps and pumping speeds were tried, production could not be increased. A bottom-hole-pressure survey indicated that froth was present. Tubing could be lowered only about two joints (from 6,796 to 6,843 feet) but this was enough to place the pump inlet below the froth, and production increased from an average of 135 barrels per day to 235 barrels per day.

REGARDLESS of the sometimes regrettable effect upon ultimate recovery, both the character of proration plans in most fields and the absence of proration in other fields generally require pumping at the maximum practicable rate.

Maximum production rate is secured by:

1. Deep tubing.
2. Adequate pump capacity.
3. Elimination of free gas from the pump.
4. Low casinghead pressure.

Minimum lifting cost is secured by:

1. A suitable pumping machine which must be adequately strong, flexible in speed, and high in efficiency as well as moderate in cost.

2. Below-ground equipment and methods of operation which require a minimum of servicing expense both for number of repairs and cost of individual jobs.

3. Power economy and use of prime movers suitable for the location—first cost, operation, and maintenance costs considered.

This paper was presented before the American Petroleum Institute, Division of Production, at the Sixteenth Annual Meeting, held in Los Angeles, November 11-14, 1935.

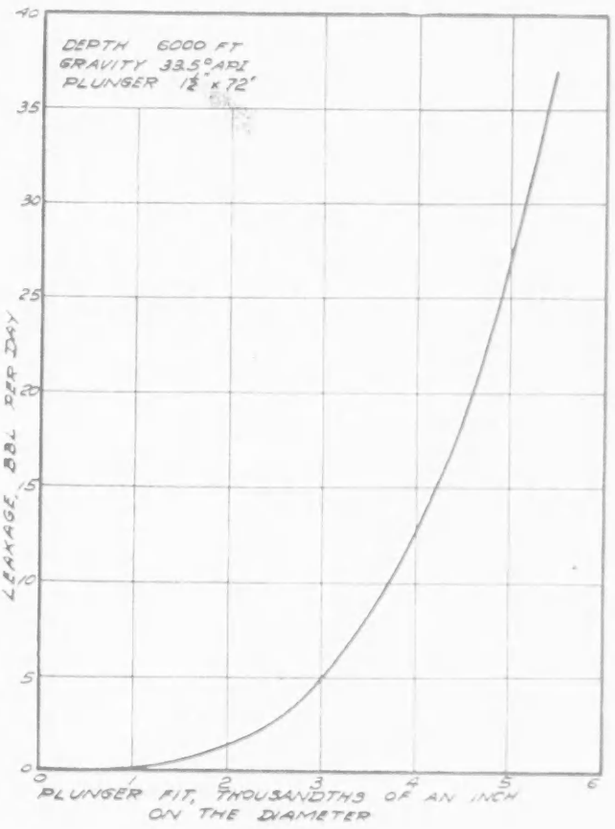
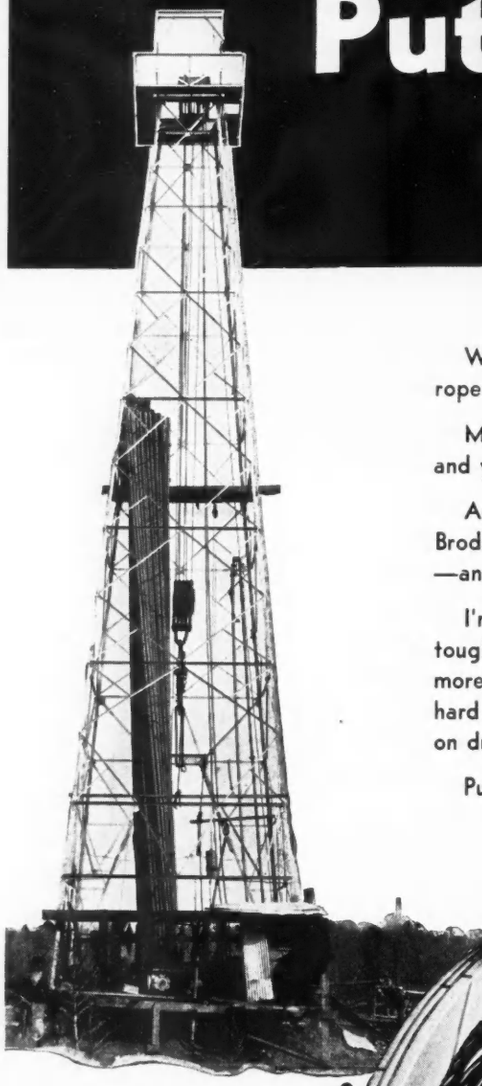


FIGURE 1

Put ME to work for YOU!



Why not? I'm "Flex-Set" Preformed Yellow Strand, the toughest rope that ever ran and landed a string of casing.

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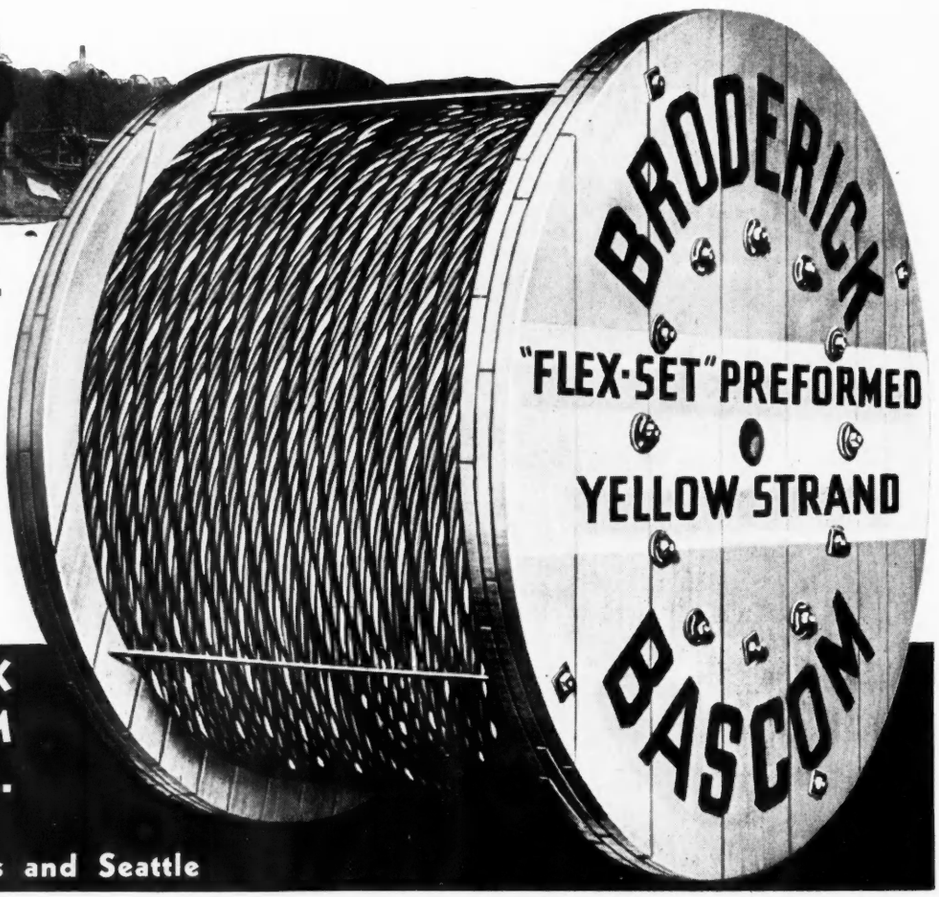
And why shouldn't I be tough? My wires are especially drawn to Broderick & Bascom's specifications. And are those specifications high—and exacting! I'll say they are!

I'm preformed, which adds a lot of other good qualities to my toughness. It makes me limber—easy to handle and install. What's more, by preforming, I'm practically pre-broken in, so you can work me hard and fast soon after putting me on. And how I do resist crushing on drums! You'll be surprised.

Put me to work for you right now. I'm tough.



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Only about 35 barrels of the increase could be attributed to lowered tubing due to lower productivity factor than in the well previously mentioned, leaving a 65-barrel increase due to elimination of froth from the pump.

2. *Pump Capacity*—The best types of modern oil-well pumps are very efficient for pumping liquids. Losses of production due to delayed valve action are small, and slippage of oil past plungers is fairly well known. Slippage has been determined by laboratory tests, and more recently by field tests. For the latter a 4,000-foot well was used. Static pressure was determined by two sub-surface pressure surveys. Tubing was tested, and found to have no leaks. Pump barrels and plungers were carefully measured before tests, and examined for wear after use. Pumps were operated without standing valves, and the tubing was filled with oil from the surface. Leakage past the plunger was determined by gaging, in a small drum, the oil necessary to keep the tubing full. Dynamometer cards were taken frequently to determine plunger action and assure that no sticking occurred. Rods were kept in motion at the same speed and stroke for each run. Figure 1 shows leakage rates computed from data of this test for a 6000-foot well. Leakage is assumed to be proportional to depth and plunger diameter, and inversely proportional to length of plunger and viscosity of oil. It was found to increase about as the cube of the fit of the plunger. As shown in the curve, an 0.002-inch clearance gives a leakage of 1.3 barrels, and an 0.005-inch clearance gives a leakage of 27 barrels per day. It is possible to have volumetric efficiencies of nearly 100 percent, although installations will require far less frequent servicing if additional displacement is provided to maintain production after pumps wear.

Selection of the correct size of pump for each condition is also important. The displacement of a pump is equal to the length of stroke, times the number of strokes per minute, times a constant which varies as the square of the diameter. Due to rod and tubing stretch, successively smaller plunger diameters

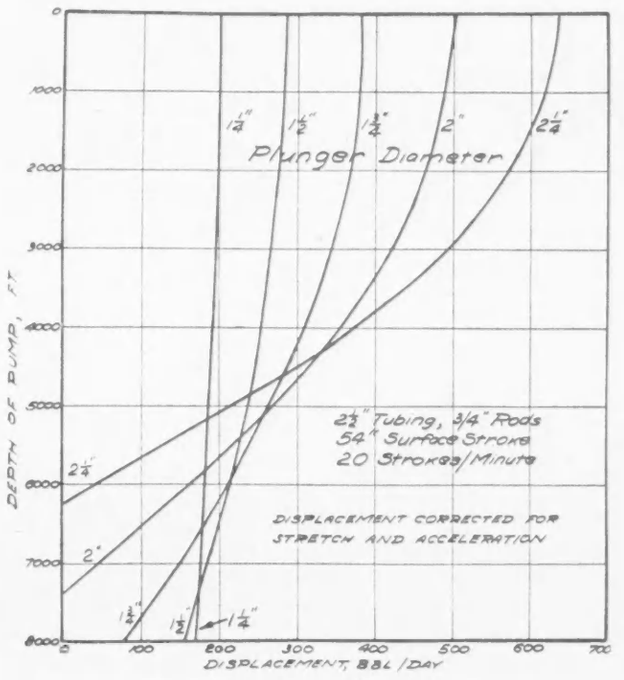


FIGURE 2

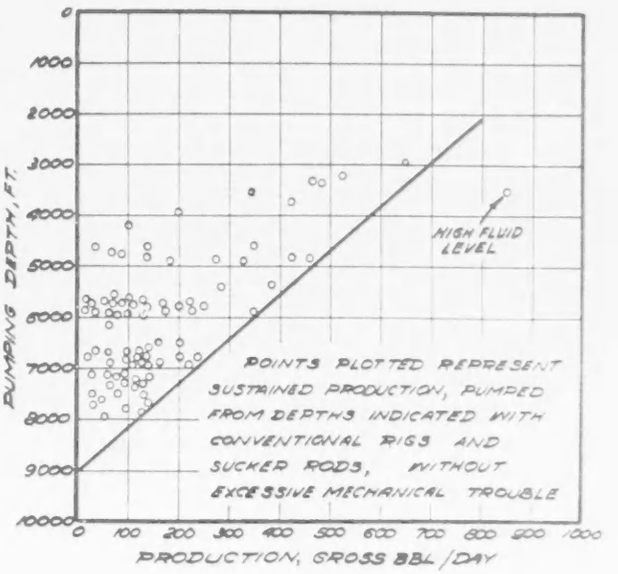


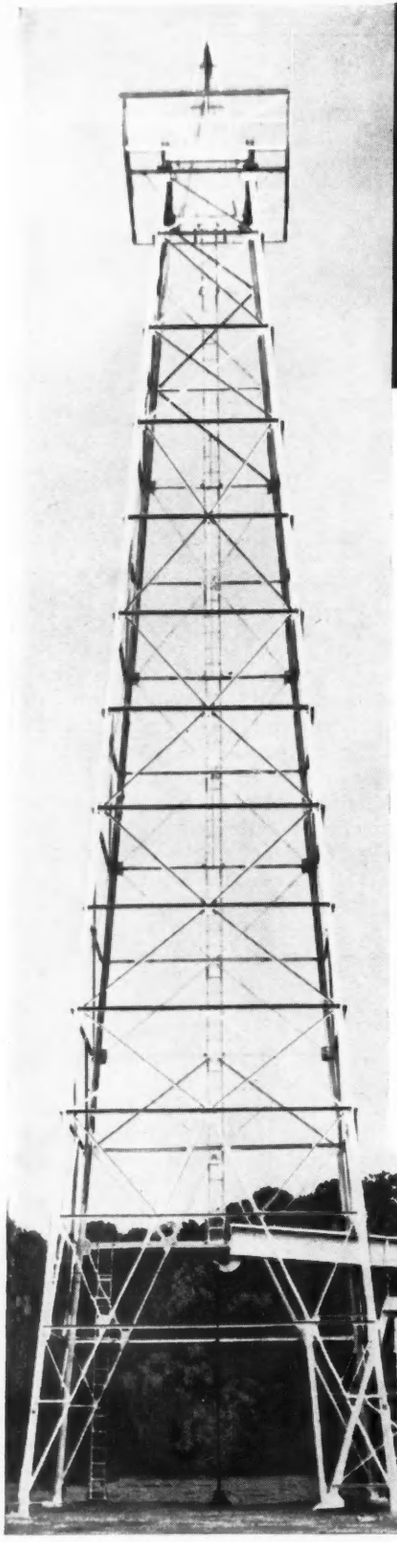
FIGURE 3

give maximum displacement as greater depths are reached. Figure 2 shows this relationship for a pumping machine giving the stated stroke and speed. The 2¼-inch plunger displaces 635 barrels at zero depth, which is more than for any of the smaller sizes. At 4300 feet, displacement has been reduced by stretch to 330 barrels per day, and equals that of a 2-inch plunger. At 6250 feet, the plunger stroke has been reduced to zero, and no production can be secured. Similarly, each size yields in maximum displacement to the next smaller size—until, at 8000 feet a 1¼-inch plunger secures the maximum displacement, 165 barrels per day. Maximum practical displacement is limited, for any depth, to the strength of rods. Figure 3, based upon experience, shows the economic limit of production for various depths. Points plotted represent sustained production pumped from fluid levels indicated with conventional rigs and sucker rods, without excessive mechanical trouble. Production declines from 800 barrels per day at 2000 feet to zero at about 9000 feet. This does not mean that more fluid cannot be pumped, but does mean that if the indicated limit is exceeded, mechanical trouble will be expensive.

3. *Gas*—An important factor in procuring maximum production is the elimination of gas from the pump. Pumping of gas takes power and utilizes displacement that should be reserved for pumping oil. It is unnecessary, as gas will flow out through the casing, if given a chance by use of an efficient gas anchor, small casing pressure, and enough clearance between tubing and casing.

Gas in the pump can seriously curtail the oil production of small wells as well as large ones. An extremely small amount of free gas in the well at the pump level may cause trouble. If 100 cubic feet of free gas per barrel of oil were to go through a pump at a 10-pound suction pressure, the displacement would be utilized in the ratio of 10.6 barrels of gas for every barrel of oil—even if the pump had sufficiently small clearance to act as a perfect compressor. A 1½-inch plunger, operating with a 50-inch stroke, would have to make 88½ strokes per minute to handle 100 barrels per day from such a well.

A gas anchor is an oil-and-gas separator attached to



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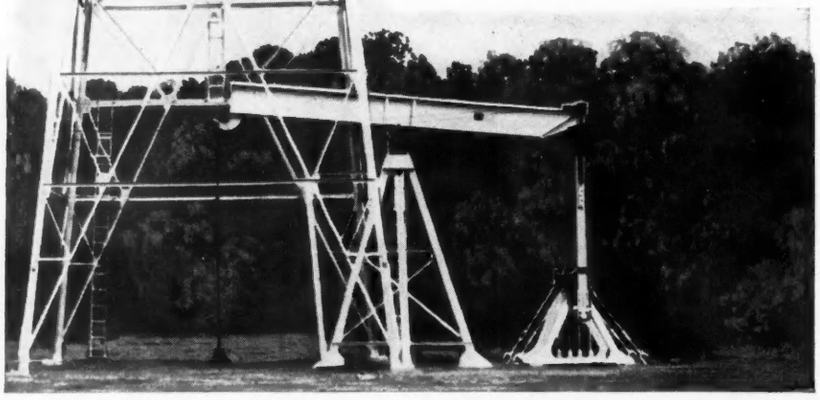

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the pump, and it should admit oil freely while preventing the entrance of gas. The only principle of separating gas from oil known to be applicable is gravity separation. Gas is lighter than oil; and, if velocities are low, will rise through it and escape. Figure 4 shows a simple type of anchor commonly in use. Oil and gas entering the anchor, start to flow downward in the annular space between the outer pipe and the inner tube, commonly called the "mosquito bill." Velocity should be less than the rate of rise of the gas bubbles through the oil. Experiments conducted at the University of Wisconsin[1] indicate that the rate of rise is normally above six inches per second in water. Capacity of an anchor is proportional to down-pass area; as the larger the down-pass, the greater the volume that can be handled at a given velocity. Length of down-pass need not be great. Anchors are commonly about 21 feet long, although shorter ones have been used. In an old well in Coalinga the fluid level was extremely low, and it was desirable to place the pump as near the bottom as possible. In this installation an anchor of only 30 inches over-all length was used, and proved entirely capable of handling the production of the well. To decrease entrance velocity and thereby reduce amount of gas drawn into the anchor and to allow free escape of separated gas from within the anchor, a multiplicity of holes in the top outer shell must be provided. Short length and large diameter for the mosquito bill will prevent reduction of pressure of oil already separated, and will prevent dissolved gas from coming out of solution and entering the pump.

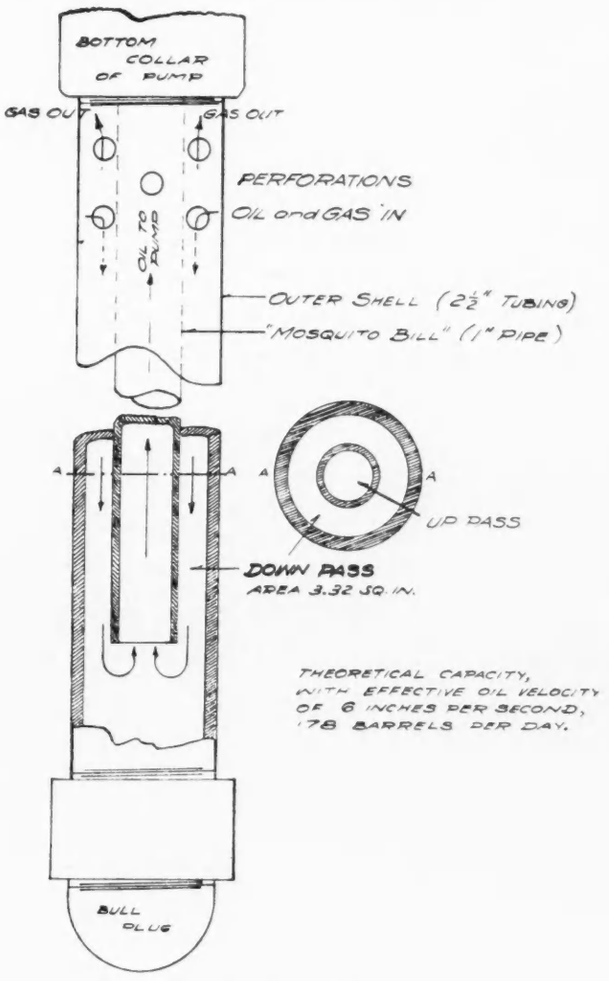


FIGURE 4

Table 1 lists the results obtained from the use of anchors in nine wells scattered from Richfield to Ventura. More cases could be cited, but these are merely intended to be illustrative. In two cases the anchors were installed where no anchors had been used before. In the remaining seven cases anchors of larger capacity replaced smaller anchors. In no case was pump displacement increased, nor was tubing lowered; so that the increases in production noted are attributable to the effectiveness of the anchors.

TABLE 1
Effect of Gas Anchors on Production

Well No.	Changed From	Changed To	INCREASE	
			(Barrels)	(Percent)
1	No anchor	Type No. 2	50	28
2	No anchor	Type No. 3	4	12
3	Type No. 1	Type No. 2	102	65
4	Type No. 1	Type No. 2	76	31
5	Type No. 1	Type No. 2	21½	88
6	Type No. 1	Type No. 2	30	158
7	Type No. 1	Type No. 2	33	21
8	Type No. 1	Type No. 2	68	110
9	Type No. 1	Type No. 2	23	23

Well No. 2 is of special interest. Originally it was producing 33 barrels per day with a pumping speed of 24 strokes per minute. In the interest of power economy, it was decided to reduce pumping speed to seven strokes —calculations having indicated that production could be secured at that speed with moderately high volumetric efficiency. The calculations were correct, power input was certainly reduced, but production secured was a great disappointment—the gage tape at the end of 24 hours showing a production of only six barrels. An anchor was installed; and, with no increase in speed, production climbed to 37 barrels per day. This was a 12 percent increase of production, and $453 per year was realized in power saving.

Some wells pump successfully without anchors due to complete absence of free gas, but they are less common than is generally supposed. A good gas anchor can do no harm. It may increase production substantially, and permit operating economies not otherwise possible.

A completely closed-in casinghead will hold a back pressure on the sand—thereby limiting potential production—and will force all gas to be produced through the pump, and make even the best gas anchor ineffective. Each 10 pounds of casinghead pressure held is equivalent, with oil of 30° A.P.I., to raising the tubing 26 feet, with accompanying loss of production as previously indicated. Reducing pressure has been advantageous on many wells. For example, in one case a reduction in pressure of only 10 pounds increased production from 79 barrels per day to 113 barrels per day.

B. Minimum Cost

1. *Sub-surface Equipment*—Needless extra expense for tubing can be avoided by careful joint making-up; as a tight joint, unless badly worn, will not leak and be cut out under load. Rod-type pumps that are run and pulled on the rods usually eliminate expense of pulling tubing for pump servicing, and should be used wherever capacity permits. As discussed in the first section, the smaller rod type may give greater displacement under some conditions than the larger tubing type. Where wear of plunger and barrel is rapid with usual types, an improvement in service will ordinarily be secured by replacement with hardened liners and plunger.

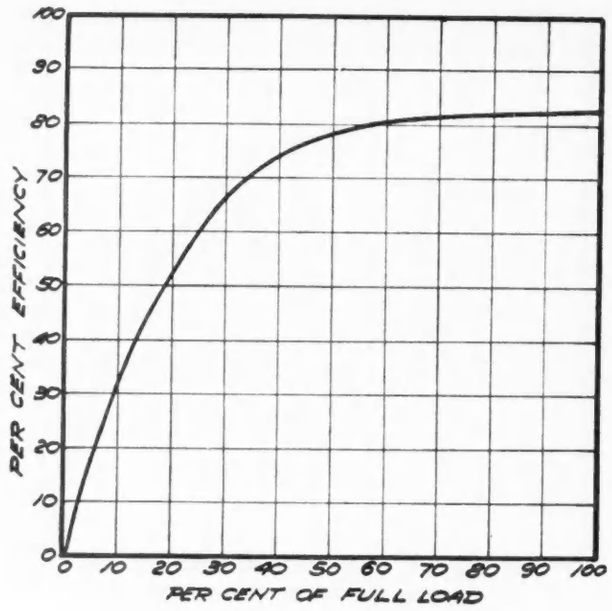


FIGURE 5

Some special pumping installations, such as the hydraulic pump, are in use; but the majority of pumping wells are sucker-rod operated. Strength of rods, both in joints and body, affects economy as well as capacity. A.P.I. Standards[2] have resulted in interchangeability between some makes—and, equally important, have resulted in better making-up of rods of the same make. Adhering to the *A.P.I. Code on Care and Use of Sucker Rods*[2] aids in prolonging life of rods and keeping costs down. Two wells of the same depth rarely have the same load, so that comparisons of life of two different makes of rods in wells pumping from the same sand are usually of no value. True comparisons can be secured by installation in a well that imposes severe service of a rod string composed of a single rod of one make followed by a single rod of a second make, and with the second make followed by the first make, and so on for the entire string. Weighing of wells and correlating loads with failure records have established fairly well the fatigue limits of present rods. If maximum loads are kept below about 27,000 pounds per square inch, rods seldom fail. For badly corrosive conditions, however, this limit must be greatly reduced. A load of 27,000 pounds per square inch is equivalent to 8300 pounds for ⅝-inch rods, 12,000 pounds for ¾-inch rods, and 16,300 pounds for ⅞-inch rods. Wells can be pumped with rod loads in excess of this amount, but failures will be inevitable. Rods do not fail because of loading to their ultimate strength, but because of continuously repeated loadings above the fatigue limit. Extensive laboratory experiments on fatigue have been applied to sucker rods, and the late Louis F. Merrill indicated that range of stress was almost as important as maximum stress; i.e., the greater the range, the lower the fatigue limit. Values given by him for rod steel of 60,000-pound yield strength for operation with large pumps at high speed, so that minimum loads are practically zero, are as follows: ⅞-inch rods, 12,300 pounds; ¾-inch rods, 9000 pounds; and ⅝-inch rods, 6200 pounds. A general rule to follow is to keep loads within the fatigue limit—and, if this is not practicable because of loss of production, to keep them as low as is possible. Records on a large number of rod failures indicate that cost of rod displacement is only about 16 percent of the total cost of putting the well back on the pump, exclusive of lost production. As most rod failures occur in the top one thousand feet of the string, the cost will be about the same for each job—regardless of the depth of the well. Also, one rod break tends to produce a second, as dropping of rods will kink those below and hasten failures. Tubing of the 2½-inch size tends to damp rod vibration and reduce peak loads usually found in pumping through three-inch tubing. Peak loads sometimes may be reduced by changes in pumping speed so small that pump displacement is hardly affected. Good counter balancing, which tends to produce a more uniform speed, will reduce loads by eliminating the whip which accompanies pumping with a drilling motion.

In addition to the above refinements, a good formula for low rod loads and, consequently, long life is as follows: Use the longest practical stroke to permit use of the smallest pump and the slowest speed that will get the production.

2. *Surface Equipment*—The pumping machine should be adequate in strength for the job, so that it is not over-loaded; otherwise failure will result, and replacement will be expensive. On the contrary, it should not be unnecessarily large, as first cost will be excessive. The new American Gear Manufacturers Association's rating form, which is still undergoing some final changes and parts of which the American Petroleum Institute has tentatively accepted, will be of great value in protection of both manufacturer and operator, as it will

[*Continued on page 61*]

TABLE 2

Cost of Gas and Electric Energy

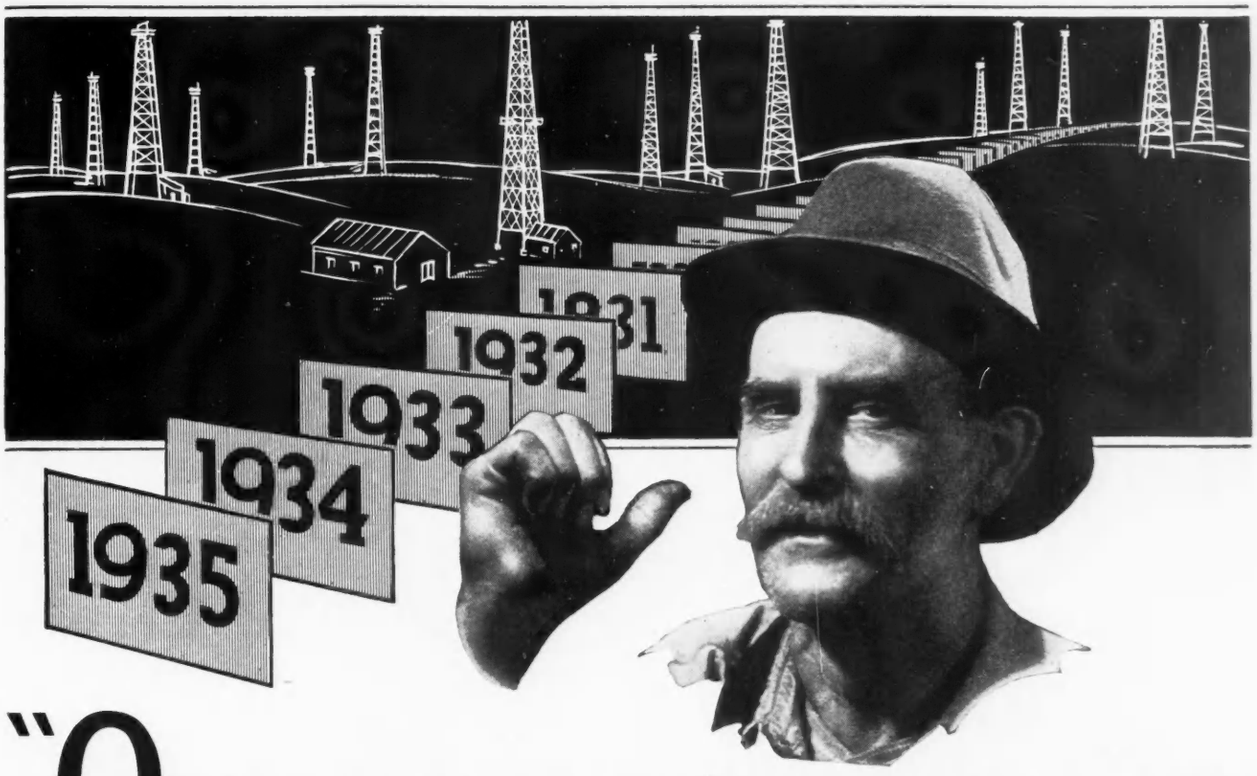
A. RATIO OF ELECTRIC AND GAS ENERGY

Cost of Electricity Per Kwh. (Cents)	Cost of Gas Per 1,000 Cu. Ft. (1,000 B.t.u. Per Cu. Ft.)						
	5 Cents	8 Cents	10 Cents	15 Cents	20 Cents	25 Cents	100 Cents
1.0	58.5	36.6	29.2	19.5	14.6	11.7	2.9
2.0	117.0	73.2	58.5	39.0	29.2	23.4	5.8
3.0	176.0	110.0	87.7	58.5	43.8	35.1	8.7
5.0	293.0	183.0	146.0	97.6	73.0	58.5	14.5
8.0	468.0	293.0	234.0	156.0	117.0	93.7	23.2

Note: Electric energy costs more than gas energy by the factors given. Cost of developed power depends upon efficiency of conversions, which is greater for electri [c] motors than for engines (see schedule "B" hereinafter).

B. COST OF BRAKE HORSEPOWER

Cost of electricity per kwh	0.75 cent	1.00 cent	1.50 cents	2.00 cents	3.00 cents
Electricity for motor per month (assumed efficiency, 85 per cent)	$4.75	$6.32	$9.50	$12.65	$19.00
Cost of gas per 1,000 cu. ft. (assumed heat value, 1,000 B.t.u. per cu. ft.)	5 cents	8 cents	10 cents	15 cents	35 cents
Gas for gas engine per month (assumed efficiency, 15 per cent)	$0.61	$0.98	$1.12	$1.84	$4.29



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NEW CHEMICAL AND ENGINEERING METHODS USED ON THREE WILDCATS

Heaving Shale Conquered

By EARL S. POST, Staff Writer

MUD and engineering experiments have been successful in overcoming heaving shale problems in three wells in the Gulf Coast of Texas. These wells are credited with the distinction of being the first to completely master this problem, which has until now cost operators millions of dollars and has prevented testing some of the most promising prospects in the heaving shale zone.

Two of the wells are located at Sheppards Mott and one is at Citrus Grove, both prospects being in the vicinity of Bay City, Matagorda County. One well had made a production test and showed for a probable producer, having possibilities of ushering in the first oil field below the shale. Second and third wells were progressing towards probable pay horizons after having passed through the shale.

Continental Oil Company's Feife 1, Citrus Grove, is down a total depth of 7485 feet, where preparations are being made to go ahead. The well is considered to be through the heaving shale at this depth, with 8⅝-inch special extreme line casing set to bottom and cemented. The manner of drilling this well will be discussed later in this article.

The success of two wells at Sheppards Mott, after 27 previously drilled tests failed to successfully drill through the formation, brings to light the importance of properly conditioned mud and careful drilling. This is especially exemplified in Helmerick & Payne's Hawkins 1, which is now coring 6570 feet in bentonitic shale, apparently beyond the heaving section. Its problems have been many, but cautious drilling with good equipment and proper conditioned muds has been the key to its success. H. M. Smith Corporation's Wadsworth Estate 1, on the extreme west flank of the same dome, is testing at a total depth of 8853 feet, where it is attempting completion. It has produced some oil from this depth, but is now trying to increase pressure and reduce an intrusion of salt water.

Mechanical Phase

Continental Oil Company has resorted to mechanics almost entirely in controlling the shale in its project. The well was commenced during the early summer of this year and has been active almost continuously since that time, making several tests, including one attempt at completion above the heaving shale. Approximately 1500 feet of this formation has been drilled and cased off to its present depth of 7485 feet.

The manner of drilling this well has been similar to the project of the same company near Seadrift, Calhoun County, completely described in THE OIL WEEKLY, July 8, 1935, pages 17-19. Loffland Brothers, Tulsa, Oklahoma, contractors, who drilled the Calhoun County well, have the contract on the Citrus Grove project, using practically the same set-up.

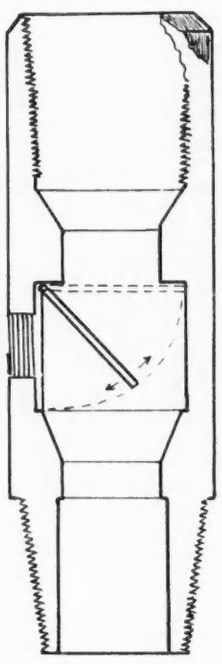
The equipment on this well includes four boilers; three mud pumps, compounded; double drawworks and double engines; hydraulic rotary, and a number of usual devices to insure continuous operation and to provide pulling and pump power when needed.

The outstanding feature of the well has been in the pipe program and its handling. A 150-foot string of 20-inch surface casing was set in the hole. This was followed by a string of 1480 feet of 16-inch casing. A third string of pipe, 11¾-inch stream line, was set to 6073 feet.

Below the 6073-foot casing seat, a special type of 8¾-inch extreme line casing-drill pipe was used for drilling the hole. The bit was a collapsible wire line proposition, to be recovered through the casing in the event it became stuck in the hole. This is the same type of equipment used in the drilling of Continental Oil Company's Moody 2, Seadrift test in Calhoun County. The Seadrift well went to a total depth of 7384 feet before the pipe became stuck in the hole and prevented further drilling.

Special Circulation Valve

The Citrus Grove test found conditions similar to those at Seadrift, but these have been overcome through the addition of a circulation valve to the drilling string. The 8⅝-inch drilling valve used in connection with the special 8⅝-inch casing, which also serves as drill pipe, has been playing an important part in the project. The chief function of this valve is to provide continuous circulation during every moment of drilling or during the entire time the circulation normally would be idle, such as when going in or coming out of the hole.



Drawing of Valve used by Continental Oil Company to insure continuous flow.

A straight string of 8⅝-inch pipe was run to a depth of 6073 feet, or at the bottom of the 11¾-inch hole, where the first valve was placed. From this point, valves were placed on every double of this special pipe, these doubles ranging from 68 to 86 feet in length.

This valve, illustrated in Figure 1, is 30 inches long, similar to

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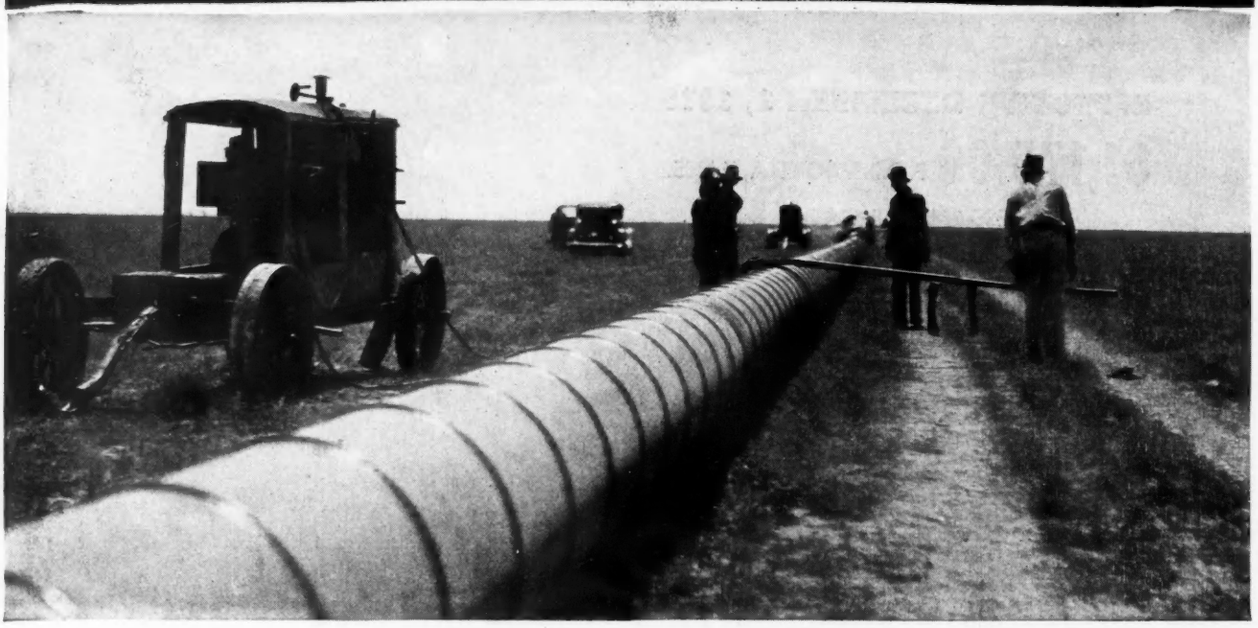

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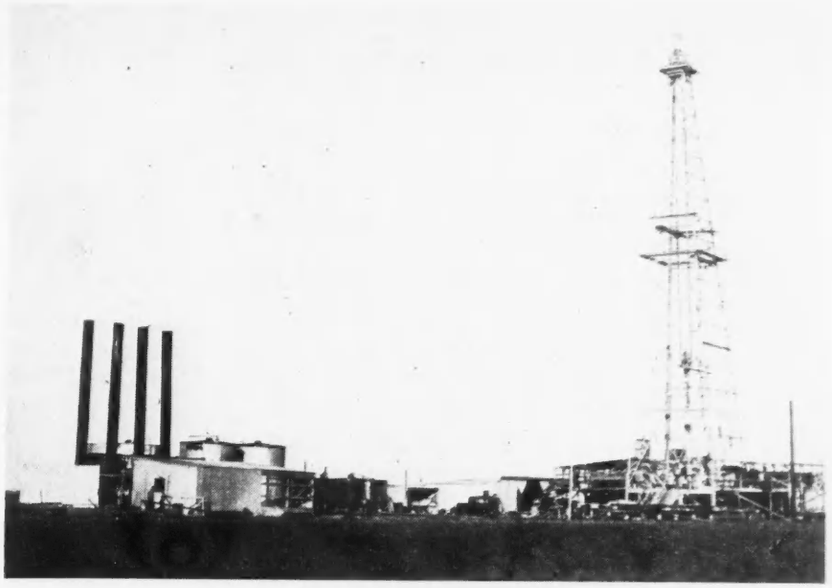


Continental Oil Company's Feife 1, Citrus Grove prospect, Matagorda County, Texas, is a well which has successfully drilled through heaving shale and has cemented at 7485 feet.

a tool joint, with threads and connections to fit the special type of pipe. The side of the valve has an opening, three inches in diameter, which is arranged to carry a mud hose connection. Inside the valve is a plate, connected to a swing. While the mud pressure is being forced through the regular channel, it forces the plate against the opening on the side of valve. When, however, the pressure is increased on the side and the pressure reduced through the kelly, the valve reverses and closes against upper seat.

In the above manner, it is possible to drill the hole the length of a double, connect the hose to the side of the valve and apply the pressure, thus continuing circulation while the changes are made above this point in the regular drill string. Upon the completion of the addition of another double, the pressure again is applied through the kelly and reduced on the valve side to allow it to close again. When the hose is removed, a plug is fastened into the opening to prevent any possible leak.

Upon reaching the depth of 7485 feet, this special string of drill pipe casing was cemented. The 1412 feet of pipe carrying the valves was backed off from the upper section of casing, leaving 6073 feet in the hole. This was effected by the installation of a back off tool at the first joint below which the valves were used. A straight string of 8¾-inch extreme line casing is to be run into the hole to fasten onto the pipe already set, whereupon the drilling will be resumed to the expected producing horizon.

Mud Conditioner

Sodium silicate has been used to a considerable degree in conditioning mud in this test, the purpose being to form a glassy surface on the walls of the hole to facilitate pushing the pipe deeper into the heaving shale.

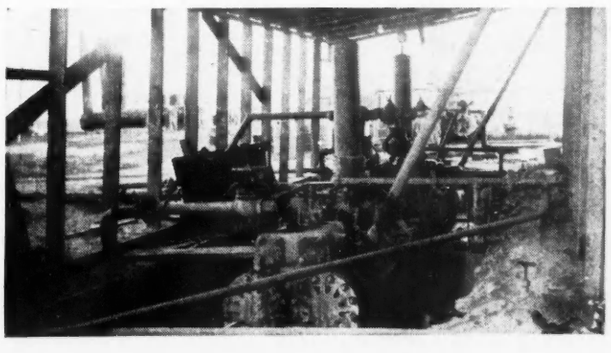
The main idea in drilling this well apparently has been to keep the mud moving through the hole at all times. In fact, every precaution has been taken to keep all necessary supplies and equipment available at all times. A pipe line has been constructed approximately 3½ miles from the nearest all-weather road to the location so fuel oil can be pumped to the location regardless of conditions. In addition, a special telephone line has been constructed from the location. A complete supply of mud, water and fuel is stored in steel tanks at the location. All equipment, the slush pit, and the majority of the rig are housed against the weather. All of these features are of utmost importance in preventing any delay, for such a delay may mean sticking of drill pipe and loss of the complete project.

Success at this operation has prompted Continental Oil Company to commence its third deep heaving shale test on the Seadrift block in Calhoun County. The first well, using ordinary drilling methods, was junked and abandoned short of 7000 feet. The second, previously mentioned, went to 7384 feet. The third well, now setting up rig, is within a few feet of both of the former tests. The same type of operation that drilled through heaving shale in Matagorda County will attempt to master the shale in Calhoun County.

Mud Is Key

Sheppards Mott's two tests offered an entirely different method of drilling through heaving shale formation. Mud was the key to success in both projects.

Helmerick & Payne's Hawkins 1, considered to be



Pump arrangement used by Helmerick & Payne on Sheppards Mott heaving shale test. Pumps are lowered to level of slush pit to reduce power energy required to lift mud.

at the top of the dome at Sheppards Mott, is coring below 6575 feet in bentonitic shale, having apparently drilled through the heaving shale section, approximately 850 feet in thickness. This well found its first trouble with the shale at about 5725 feet, and when a depth of 6000 feet was reached a string of 8⅝-inch casing was set. The string consisted of 800 feet of semi-flush joint pipe on bottom with the remainder regular seamless casing. The first attempt to run the casing failed, but the hole was reconditioned with different mud, water being largely replaced by a prepared chemical solution. The casing was then run and landed at 5980 feet, considered sufficiently close to bottom to cement and drill ahead.

Drilling from this point was carried on with special care. Patented mud and chemical solution made up the complete drilling mud. The mud's weight was increased to 13 pounds, carrying a viscosity of 38 to 40. Jelling condition of the mud under the high viscosity made it necessary to cut the viscosity to about 25. The results were not as high as desired, but progress was made with comparative ease.

As drilling progressed below the casing, the hole showed fair condition. Each round trip, however, it became necessary to ream practically the entire hole to clear the shale which had fallen into the hole. This could be done at a speed not to exceed five feet per hour, the purpose being to condition the hole.

Slow Drilling Necessary

Slow drilling and conditioning of the hole is explained by the necessity to build a wall of heavy mud in the well and to drive the solution into the formation to kill possibility of its breaking down. Heaving shale atop the dome is broken by a series of very thin sands, possibly of knife blade thickness. These sands are highly charged with gas pressure, although they carry a small volume. They are referred to as dynamite by the drillers. In packing this solution into the hole, pressure, plus a certain saturation, drives mud into the thin sands, completely killing them. Drilling rapidly may sufficiently wall the hole to prevent natural sloughing of the formation. On the other hand, by having a mere crust over the edges of these sands, it is highly probable that they would build up sufficient volume to break down the mud and bridge the hole. This gas sand hazard is best sown on the ditch, mud returns carrying heavy shows of gas from time to time.

Helmerick & Payne's well is checking 1600 feet higher than a well on the west flank of the dome, which apparently adds to the hazard of drilling this shale. High compression has set in upon the shale during the rise of the salt, likewise, a squeeze on the sands have further increased their pressure.

In discussing the mud used in this well, it is interesting to note that during operations with commercial mud and chemical solution, the supply remained rather steady. When water was mixed with the mud, it began losing both volume and weight, a 3000-sack decline being shown in three days. The weight dropped to 12 pounds from its former 13-pound level. The mud was reconditioned and has built up to 12.4 pounds with volume also showing an increase. Mud normally is approximately 35 percent solids and 65 percent water. The mud in this hole is approximately 50-50.

Pumps and Rig

Due to the weight of the mud and its condition, a special pump hook-up was arranged. Pumps were lowered into cellars about the same level as the slush pit, the intake pipes being connected through holes in the side walls of the slush pit. This enabled the mud to be drawn into the pumps with a lift of only several inches. It is pointed out that the lift on the pump is probably a greater strain than the push after the fluid has been picked up. This is best shown in the fact that pump repair costs have been reduced to practically nothing. Two pumps are compounded with a third (ordinarily used for mixing purposes) set-up as an auxiliary. It also can be compounded with the two regular duty pumps. The slush pits and ditch are completely enclosed to prevent rain from thinning the mud.

The rig used on this job is one of the heavier type Gulf Coast outfits, using two drawworks and engines. Four-inch drill pipe is being used on a 7¾-inch hole at the present level.

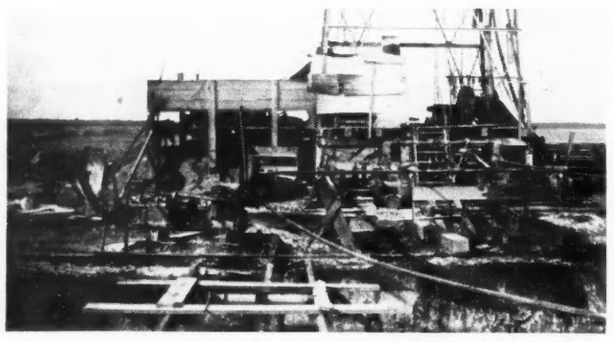
Coring has been carried on with comparative success. Very slow coring as well as slow recovery of the core tube under continuous circulation permits this operation.

H. M. Smith Corporation's Wadsworth Estate 1, located 12,000 feet west of the Helmerick & Payne well, is trying to complete at a total depth of 8853 feet, in oil sand. It has shown considerable oil and is expected to make a commercial producer when finally completed.

This well was drilled with ordinary equipment used for holes down to 6000 feet, hence its depth of nearly 9000 feet without combating elements of heaving shale would be considered a remarkable job. The well, however, did experience some difficulties in reaching production.

Sloughing Shale

Owners of the Wadsworth well classify the shale section, some 800 feet in thickness, as a sloughing



Looking across slush pits of H. M. Smith Corporation's Wadsworth 1, at Sheppards Mott, Matagorda County. This illustrates comparatively light equipment used in drilling this hole to 8853 feet, where it is in process of completion.

shale rather than a heaving shale. Like the Helmerick & Payne project, this test found numerous thin, high pressure gas sands which had to be fought with mud.

The well set approximately 1000 feet of surface casing and drilled nearly 7500 feet of open hole below the surface pipe before setting another string. The seven-inch pipe was set at 8376 feet, tests being made through perforations at 8128-55 feet, which developed some oil. The well was carried ahead, however, to the present total depth, and landed a liner with 200 feet of screen on bottom. Efforts to complete as a commercial producer are now being made.

In drilling the hole, natural mud was used almost entirely. Special care, however, was taken to cool the mud as soon as it came from the hole, and to keep it cool at all times. When any water was added, which was as rarely as possible, the water was fresh and cold. Drilling was carried on steadily to prevent any agitation.

After the sloughing shale had been encountered, every precaution was taken to prevent caving formation and bridging to stick the drill pipe. When the pumps showed signs of slowing due to the falling shale, they immediately were stopped and the drill stem raised to a point above the caving. The hole was then redrilled in an effort to again build up the wall. When the well was idling, the drill stem was allowed to rotate slowly with pumps running very slowly or completely shut off.

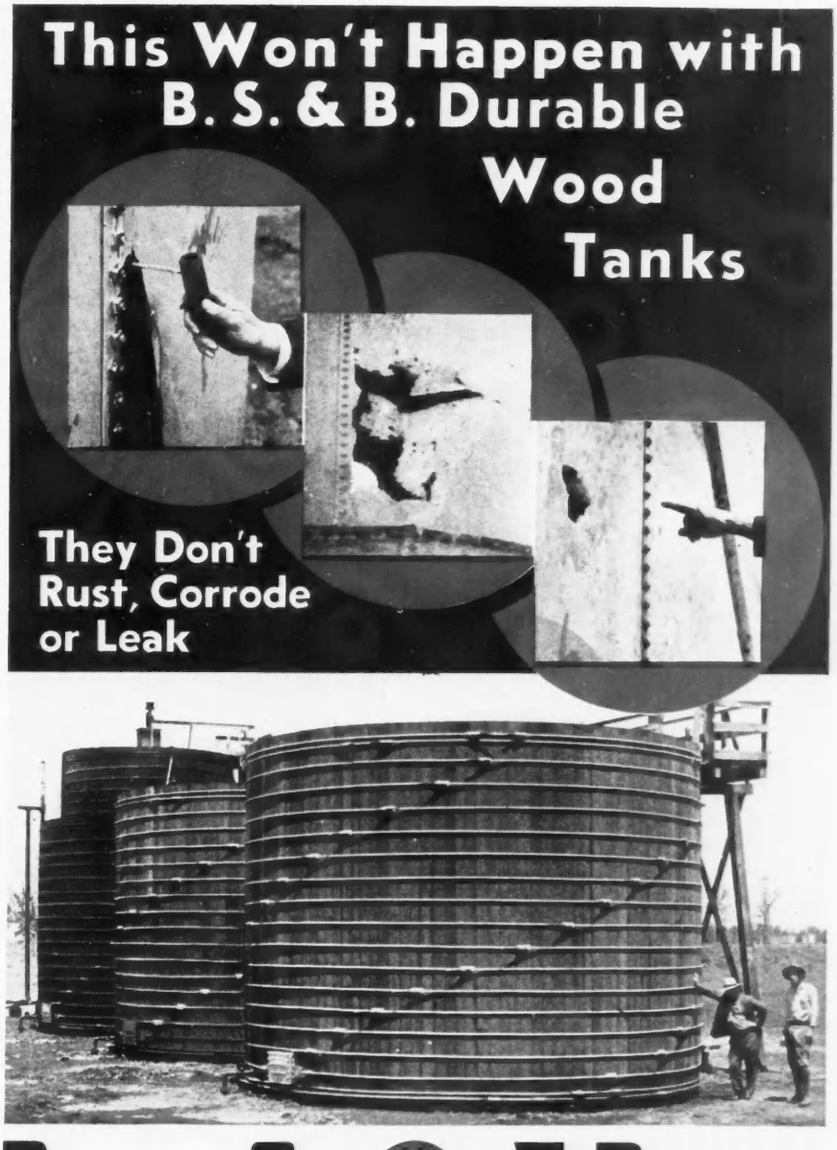
Blowout

When the present producing sand was encountered, the well blew out and broke down considerable of the wall of the hole. As mud was circulated, it became cut with gas. Commercial mud, diluted with chemical solution, rather than water, however, conditioned this portion of the hole sufficiently to allow the setting of liner and screen for completion. Mud averaged 10.2 pounds upon being pumped in the hole and returned at a weight of 9.5 pounds, indicating considerable of the heavier solids being taken into the walls of the hole.

The two wells had several happenings in common, both using chemical solution for dilution of the commercial mud rather than water. While the Smith project used only a small amount of commercial mud, approximately 100 tons were used in the Helmerick & Payne test. The Helmerick & Payne test had drill stem stuck, while the Smith well could not set liner due to the condition of the hole. Both holes were finally conditioned through the use of chemicals.

The Discorbis section of the Oligocene formation provides the most difficult shale to master. In these wells, the first shale was encountered just above the Discorbis and continued down to about the top of the Frio.

The success of the three wells in combatting these shale problems undoubtedly does not solve the problem generally, but it does complete another chapter in the volume of important drilling and engineering history being written through experiments at this time. It does suggest, however, that heaving shale or any of its relative shales, will be drilled in the future with special attention paid to mud control influence, continuous circulation, and improved casing practices.



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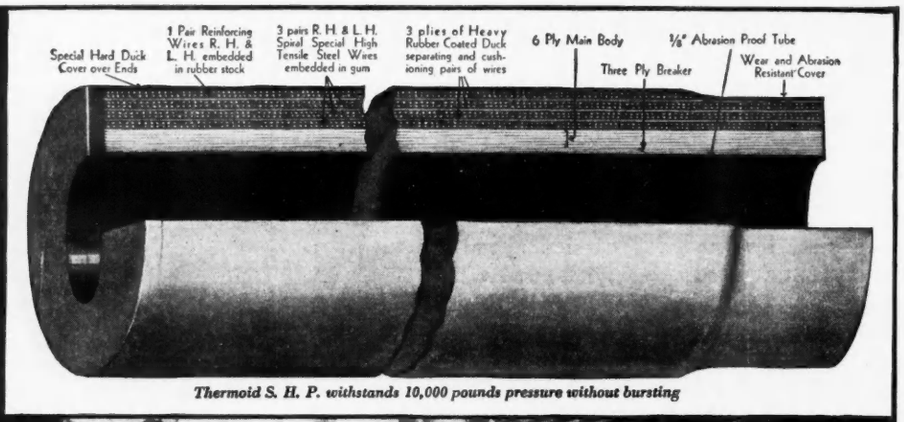
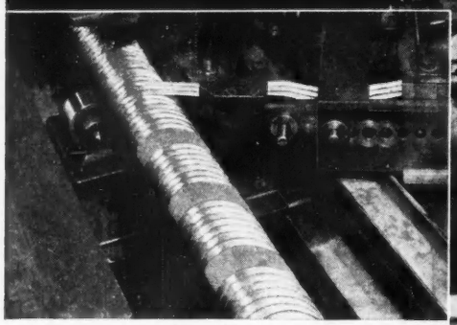
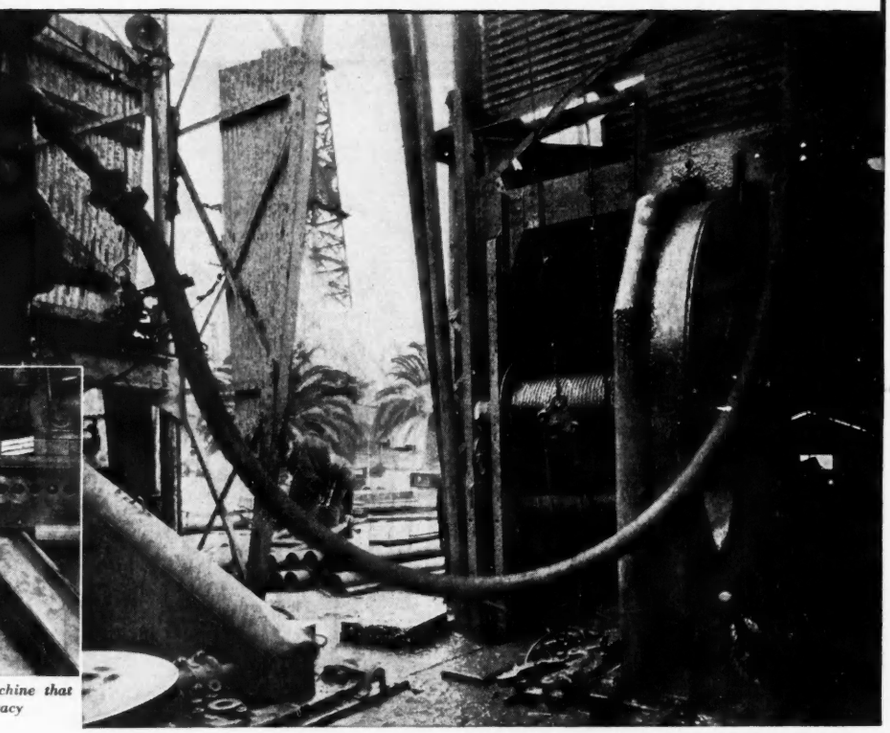

Special Hard Duck Cover over Ends
1 Pair Reinforcing Wires R. H. & L. H. embedded in rubber stock
3 pairs R. H. & L. H. Spiral Special High Tensile Steel Wires embedded in gum
3 plies of Heavy Rubber Coated Duck separating and cushioning pairs of wires
6 Ply Main Body
Three Ply Breaker
1/8" Abrasion Proof Tube
Wear and Abrasion Resistant Cover

Thermoid S. H. P. withstands 10,000 pounds pressure without bursting



Here's the secret of Thermoid's strength, a machine that winds the duck and wire with scientific accuracy



IT'S just "too bad" when rotary hose blows out. Slush all over. Pumps shut down. Drill pipe "frozen" in the hole. A new hose to buy. That's why the factor of safety between working pressure and bursting pressure means so much in rotary hose. You can't afford to buy blindly.

Whether you are drilling in East Texas with 500 pounds working pressure, or in Kettleman Hills with 2,500 pounds, the safety factor is all important. You can be sure of getting the margin you require in Thermoid Rotary Hose. Size for size, and grade for grade, it has greater strength than other hose.

That's because Thermoid Hose is *machine-made* instead of handmade. This insures uniform tension, uniform spacing, and the scientifically correct wrapping angle in the duck and wire plies—all of which mean greater strength, less elongation, less change in diameter.

To take all doubt and guesswork out of buying rotary hose, Thermoid has formulated a simple, but scientific guide for you. For each size in every grade of Thermoid Rotary Hose, it gives the test bursting pressure, proper working pressure, elongation, and body diameter change. This and other data is contained in a booklet that is yours for the asking.

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Markets Steady

PRICES UNCHANGED DESPITE ADVENT OF COLD WEATHER

CONSIDERING that wintry weather has begun to curtail gasoline consumption, the markets last week turned in a satisfactory performance, with prices generally holding unchanged at comparatively favorable levels.

For the immediate future, moreover, the prospects appear encouraging, with no factors in the picture to indicate that any serious weakening of prices is impending.

To offset the advent of less favorable motoring weather, the refining branch of the industry has curtailed plant operations. Consequently the supply of gasoline is being held in close conformity with demand. Furthermore, crude oil production is being balanced fairly well with the refinery requirements; and the crude market, like the gasoline market, is continuing especially firm for this time of year.

Crude production in California has continued above the limits within which producers have sought to stay, and the crude market in that region thereby has been unfavorably affected. But the effect of the California situation is confined largely within that particular area.

Tending to strengthen the markets outside California last week was indication that hot oil output in East Texas was about 5000 barrels a day lower than in the previous week in averaging around 30,000 barrels daily.

Gasoline Stocks Decline

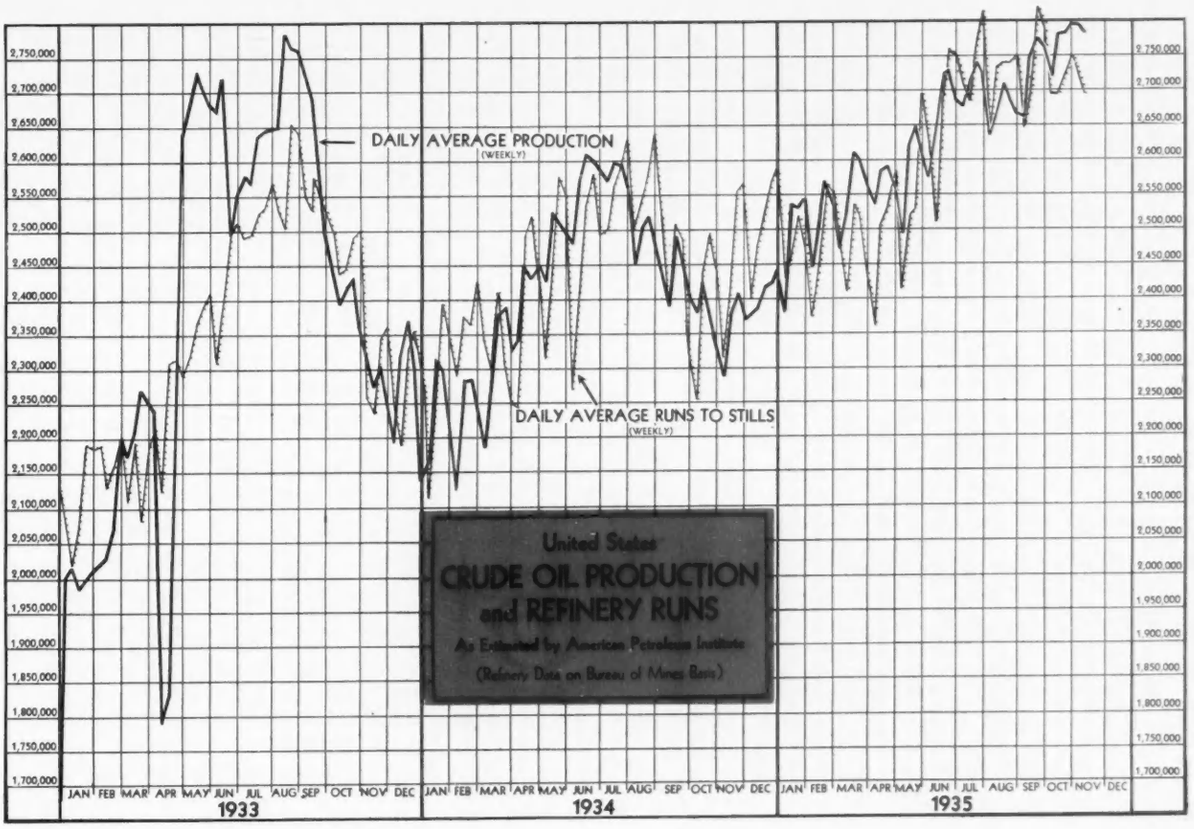
In its report for the week ended November 9 the American Petroleum Institute showed United States crude production up 3900 barrels above the previous week's level in averaging 2,802,250 barrels daily. That estimate indicated a rather serious excess of crude output over market requirements.

But a more favorable adjustment of refinery operations to demand was at the same time indicated. During the week ended November 9 the crude runs to stills in the United States, on the Bureau of Mines basis, were 30,000 barrels a day lower than in the previous week in averaging 2,695,000 barrels daily. Meanwhile the total stocks of finished gasoline in the country declined 578,000 barrels, or to 40,780,000 barrels as of November 9. The stocks on hand November 9 were slightly lower than on the comparable date a year previously.

Gasoline Market Steady

The past week brought no perceptible change in the refined product prices in the Mid-Continent. After sagging slightly the week before, gasoline tank car prices in East Texas were holding fairly steady. The prices in the Group Three (Oklahoma) region and in North Texas also were mostly unchanged last week, as they had been in the preceding week.

The East Texas market apparently was reflecting the slight reduction of hot oil output to some extent. A favorable factor in connection with the East Texas hot oil situation is the fact that confiscated oil is gradually being disposed of and removed as a market disturbing influence, although substantial



quantities of such material continue to hang over the market.

Tank Car Prices Holding

Gasoline tank car prices in the Mid-Continent continue around the highest levels of the year and about the best for five years. They reflect the unusually effective balancing of supply with demand, as regards both crude and refined products, as well as the continued consumption of oils at comparatively high levels. Through this combination of favorable circumstances the prices have withstood the strain usually encountered following Labor Day, when consumption normally begins declining.

U. S. motor gasoline last week continued to be priced for tank car shipment from Oklahoma and North Texas refineries at the following levels: third grade, below 62 octane, 4¾ cents a gallon; standard grade, 62-67 octane, 5¼ cents; premium grade, 68-70 octane, 5⅝ cents. Similar materials of strictly legal standing and eligible for federal tenders were selling, meanwhile, in East Texas at 4⅝, 5⅛, and 5½ cents, or for one-eighth cent a gallon less than in the upper Mid-Continent.

East Texas third grade gasoline of questionable origin, having difficulty in qualifying for federal tenders, has been selling in the meantime at 3 to 3½ cents a gallon, for rail or truck shipment within the state, with the state control less rigid, particularly as regards truck movements. Some off-color gasoline from inferior plants has been available to truckers lately for even less than 3 cents a gallon.

Kerosene has been bringing refiners 3¼ cents a gallon in East Texas and North Texas, and 3⅜ cents in the Group Three territory.

Beaumont, Texas.—Sun Oil Company's crude oil shipments from Texas Gulf Coast terminals at Sun and Sabine Pass during September aggregated 1,340,541 barrels, all moving coastwise.

East Texas Tank Car Shipments

Week Ending November 10, 1935

PRODUCTS	No. Cars	Estimated Gallons
Gasoline	533	4,323,117
Fuel oil	271	2,557,467
Casinghead gasoline	216	1,875,139
Distillate	49	396,913
Topped crude	24	213,985
Kerosene	25	200,619
Gas oil	15	121,940
Residuum	5	40,485
Naphtha	1	8,152
Total	1,139	9,737,817
Total previous week	1,312	11,233,944
Intrastate	399	
Interstate	395	
Coastwise	345	
Total	1,139	

ITALY'S BUYERS

Express preference for Mirando grade of crude

San Antonio.—Inquiries made recently by representatives of the Italian government to brokers and pipe line companies engaged in handling Mirando grade crude in Southwest Texas involves purchase proposals for the delivery in tanker lots of from 1,000,000 to 2,000,000 barrels within the next year or 18 months at a price of 99 cents per barrel loaded aboard ship. Although a specific price is set forth in the purchase terms, according to reports, provisions are made for a uniform variation of this price to coincide with any changes made in price postings by majors.

Negotiations are known to be pending between agents of the Italian government and several independent concerns that specialize in the sale of Southwest Texas crudes in cargo lots. However, the latter have virtually cleaned up all available surplus crude stocks, and crude committments must be covered by future production, which is subject to proration restrictions.

Southwest Texas crudes, averaging 21-22 gravity, have found a ready market in Italy because of the high yield of Diesel oil, low cold test fuel oil, and other by-products specially adapted to marine requirements.

HOT OIL OUTPUT

Is estimated at 20,000 barrels in East Texas

Tyler, Texas.—Current production of illegal crude in the East Texas field is estimated at from 20,000 to 25,000 barrels daily.

The Federal Tender Board is credited with applying rigid enforcement of the Connally Measure that prohibits interstate shipments of hot oil products, and has lately virtually eliminated tank truck movement of illicit oil to Shreveport and other points in Eastern Louisiana. State enforcement agencies are conceded to be waging an aggressive campaign against violators with tangible results.

Although hot oil production is at a comparatively low level it is sufficient to depress market quotations on gasoline and other products restricted to Texas consumption.

East Texas refiners that are unable to qualify for federal tenders in marketing their output are receiving from three to 3¼ cents per gallon for gasoline moved via rail or truck, while some off-color material is selling at a fraction under three cents. Majors are tapering off their gasoline purchases from East Texas refiners that can furnish federal tenders. This is creating a slight surplus that is moving to northern markets at about 4½ cents per gallon. However, majors are adhering to their long established price of 4⅝ cents for U. S. motor grade gasoline in restricting their purchases.

E. M. (Big Boy) PINCKARD, scout for Pure Oil Company, Houston, and G. W. Arnold, head of the land department, are hunting deer in Webb County.

Summary of Wells Completed in the United States Week Ending November 9, 1935

	Completions	Oil Wells	Gas Wells	Failures	Initial Production	Total Completions 1935	Total Completions this date 1934
Alabama	...	...	...	...	.....	4	3
Arkansas	...	...	...	...	.....	112	72
California	12	10	....	2	4,670	746	353
Colorado	...	...	...	...	.....	10	20
Illinois	...	...	...	...	.....	9	14
Indiana	...	...	...	...	.....	170	130
Kansas	19	13	...	6	7,504	1,215	782
Kentucky	...	...	...	...	.....	149	220
Louisiana	8	4	1	3	4,414	619	656
Michigan	21	13	3	5	1,665	491	395
Mississippi	...	...	...	...	.....	18	34
Montana	4	1	3	...	158	148	165
New Mexico	8	7	...	1	23,346	244	97
New York	...	...	...	...	.....	...	4
Ohio	...	...	...	...	.....	1,250	874
Oklahoma	43	22	1	20	19,856	2,058	1,572
Pennsylvania	...	...	...	...	.....	113	256
Texas	175	126	3	46	236,840	10,162	8,213
Utah	...	...	...	...	.....	1	3
West Virginia	...	...	...	...	.....	424	338
Wyoming	2	2	...	...	2,670	62	40
Total this week	292	198	11	83	301,023	18,005	14,347
Total last week	438	271	49	118	595,674	...	...
Total this year	18,026	11,856	1,500	4,670	33,251,036	...	...

Comparison of Permits Granted for New Wells

STATE	Week Ending Nov. 9	Total this Mo.	Total this Year	Total this Date Last Year	1934 Year Total
Arkansas	1	3	54	70	100
California	10	26	838	501	629
Louisiana	13	30	736	721	799
Kansas	12	41	1,005	852	1,015
Michigan	15	30	642	400	460
Oklahoma	37	90	1,966	1,747	2,045
Texas	137	380	9,574	8,906	10,550
Total	225	600	14,815	13,197	15,598

PRODUCTION UP
270,200 barrels excess market demand estimate

DAILY crude oil production in the United States for the week ending November 16 rose to 2,833,900 barrels, an increase of some 32,000 barrels over the previous week. The large producing areas of Texas, Oklahoma and Kansas contributed to the increase while California showed a very small reduction in output. The daily average was around 270,200 barrels over the indicated market demand for November as estimated by the Bureau of Mines. The advance of cold weather was noticed in material reductions in Michigan and the Eastern States, but the Rocky Mountain area and New Mexico remained virtually unchanged.

Crude production in Texas increased 11,400 barrels the past week as a result of gains recorded in the Gulf Coast and West Texas areas. The Panhandle was down somewhat but the other fields were practically unchanged, with East Texas showing the normal increase as a result of new producers completed. The 1,036,800 barrels daily output was some 9800 barrels over the November indicated market demand. Hot oil production and refining in the East Texas field (not included in the above figures) dropped back to around 30,000 barrels per day, according to the last reports. In spite of the recent stringent efforts of the new proration chief in that area, it seems that the illegal flow of crude and refined oil in East Texas is still to be reckoned with.

California crude output was but little changed from the previous week with a lower production of 1500 barrels. The largest change and the one responsible for the decrease occurred in Kettleman Hills where a drop of 5500 barrels was noted. The higher prices on the West Coast will probably stimulate more drilling and search for new fields. This makes the 505,000 barrels estimated by the Bureau of Mines as the November daily market demand for California seem out of line with the 680,000 barrels, and more, actually being produced each day.

Daily crude production in Oklahoma gained some 23,675 barrels over the output of the previous week as heavy runs were made on the new month's allowable quotas. Oklahoma City, Seminole, and Fitts fields showed the heaviest gains to raise the state total to a daily average of 514,250 barrels, which is some 22,250 barrels over the November demand estimate.

Kansas also showed gains over the previous week to raise the state total to 144,600 barrels per day, an increase boosted by most all the producing areas. The daily average increase over the previous week was enough to exceed the market demand estimate by some 1300 barrels.

Louisiana and Arkansas were but little changed from the daily crude output of the previous week, although

United States Crude Oil Production
Estimates Compiled by THE OIL WEEKLY

DISTRICT OR STATE	BARRELS DAILY FOR WEEK ENDING November 16	November 9
TEXAS—		
Texas Panhandle	54,500	55,600
North Texas	59,100	59,100
West Central Texas	25,500	25,500
West Texas	161,500	155,400
East Central Texas	44,900	44,800
*East Texas Field	431,600	430,400
†South Texas	61,800	61,200
†Texas Gulf Coast	197,900	193,400
*Total Texas	1,036,800	1,025,400
OKLAHOMA—		
Oklahoma City	156,725	144,200
Seminole Area	123,225	115,200
Tatums	4,200	4,200
Lucien	9,950	10,100
Fitts	35,125	25,025
Edmond	6,425	8,675
Others	178,600	183,175
Total Oklahoma	514,250	490,575
KANSAS—		
Ritz-Canton	6,425	6,650
Voshell	4,725	3,300
Nikkel-Hollow	5,900	5,150
Sedgwick	6,850	6,700
Oxford	5,550	5,100
Burrton-Haury	18,250	16,425
Lorraine	9,100	8,675
Others	87,800	83,675
Total Kansas	144,600	135,675
LOUISIANA—		
North Louisiana	30,900	32,800
Louisiana Gulf Coast	129,750	127,800
Total Louisiana	160,650	160,600
ARKANSAS	29,800	29,500
CALIFORNIA—		
Long Beach	78,500	76,500
Santa Fe Springs	54,000	55,500
Huntington Beach	46,500	45,000
Dominguez	23,000	22,500
Inglewood	18,000	14,500
Ventura Avenue	39,000	38,000
Seal Beach	6,000	7,000
Midway-Sunset	59,500	60,000
Elwood	16,000	16,500
Kettleman Hills	110,000	115,500
Mountain View	39,000	38,000
Playa del Rey	16,500	18,000
Others	175,000	175,000
Total California	681,000	682,500
MOUNTAIN STATES—		
Wyoming	37,100	37,000
Montana	13,000	13,000
Colorado	4,250	4,350
Total Rocky Mountain States	54,350	54,350
NEW MEXICO	56,800	56,800
EASTERN STATES	104,650	111,000
MICHIGAN	51,000	55,500
*Total United States	2,833,900	2,801,900
*Surreptitiously produced oil in East Texas, not included in above figures, estimated at	30,000	35,000
Grand Total, including surreptitious production	2,863,900	2,836,900

† Coastal District of South Texas included with Texas Gulf Coast.

Crude Runs to Stills; Finished and Unfinished Gasoline; Gas and Fuel Oil Stocks, and Cracked Gasoline Production, Week Ended November 9, 1935

(Figures in thousands of barrels of 42 gallons each)

DISTRICT	Dailey Refining Capacity of Plants			Crude Runs to Stills		Stocks of Finished Gasoline			(*) Stocks of Unfinished Gasoline	(†) Stocks of Other Motor Fuel	Stocks of Gas and Fuel Oil	Daily Charging Capacity of Cracking Units			Cracked Gasoline Production
	Potential Rate	Reporting		Daily Average	% Operated	At Refineries	Bulk Term., in Trans. & Pipe Lines	Total at Refys. Term. etc.				Potential Rate	Reporting		Daily Average
		Total	%										Total	%	
East Coast	612	612	100.0	476	77.8	4,046	7,660	11,706	773	195	12,457	534	534	100.0	108
Appalachian	154	146	94.8	104	71.2	1,006	800	1,806	256	75	963	79	78	98.7	24
Ind., Ill., Ky.	442	424	95.9	359	84.7	3,725	3,378	7,103	582	45	4,079	349	348	99.7	109
Okla., Kans., Mo.	453	384	84.8	279	72.7	2,494	1,591	4,085	444	715	4,790	256	228	89.1	63
Inland Texas	330	160	48.5	91	56.9	966	106	1,072	178	1,645	1,606	148	105	70.9	25
Texas Gulf	617	595	96.4	509	85.5	4,725	176	4,901	1,434	115	11,511	399	393	98.5	128
Louisiana Gulf	169	163	96.4	126	77.3	698	384	1,082	271	.....	4,864	77	74	96.1	27
North La., —Ark.	80	72	90.0	42	58.3	162	60	222	46	175	505	46	44	95.7	7
Rocky Mountain	97	60	61.9	36	60.0	582	.....	582	100	110	798	46	39	84.8	15
California	852	789	92.6	484	61.3	6,252	1,969	8,221	967	1,860	65,935	280	280	100.0	62
TOTALS WEEK November 9, 1935	3,806	3,405	89.5	2,506	73.6	24,656	16,124	40,780	5,051	4,935	107,508	2,214	2,123	95.9	568
November 2, 1935	3,806	3,405	89.5	2,548	74.8	24,865	16,493	41,358	5,163	5,050	108,441	2,214	2,123	95.9	568

Below are set out estimates of Crude Runs and Cracked Gasoline Production on B. of M. Basis for Week Ended November 9, 1935 compared with November 1934 bureau figures.

Estimate B. of M. Basis November 9, 1935	2,695		605
Estimate B. of M. Basis November 2, 1935	2,725		605
U. S. P. of M., November, 1934 Daily Average Crude Runs	2,446	U. S. B. of M., November, 1934: Daily Average Cracked Prod.	520

(*)Amount of Unfinished Gasoline contained in Naphtha Distillates.
(†)Estimated Includes Unblended Natural Gasoline at refineries and plants; also Blended Motor Fuel at plants.

Northern Louisiana showed a decline in the new Rodessa area to be balanced by increased production on the Coast. This gain in the Coastal section is in keeping with activity in the same area in Texas. The indicated market demand of 127,100 barrels is around 33,500 barrels under the daily average in Louisiana, while it is only 700 barrels under the daily output of Arkansas.

The output in other sections of the country remained about the same with the notable exceptions of Michigan and the Eastern States. Winter weather lowered production in Michigan, which has recorded considerable gains in the past few weeks, from 55,500 barrels daily in the previous week to 51,000 barrels in the week just passed. This is 10,600 barrels over the daily November estimate. The Eastern States daily production fell, with the advance of colder weather, from 111,000 barrels to 104,650 barrels to exceed the November estimate by only 6950 barrels.

OKLAHOMA MARKET

Tulsa, Okla. — The Mid-Continent refined products market, Group 3, Oklahoma, remained practically unchanged during the past week, with the exception that it was apparently slightly stronger. Prices, however, remained the same.

Zero test straw distillates and straw gas oils were reported especially strong, and probably in a position to move upward.

Bad weather and freezing temeperatures made roads in a large portion of the northern Middle West either impassable or hazardous during the early part of the week. This of course was reflected in the gasoline market, where the demand had declined slightly.

PRICE CUT RUMORED
Lower gasoline postings expected in California

Los Angeles. — Rumors apparently well founded were being circulated late November 15 that a major company on November 18 would reduce retail gasoline prices in Southern California from two to four cents a gallon. It was known, moreover, that at least two other major companies would follow, in such event.

Independents in the general Los Angeles area continued late last week to sell from two to 3½ cents under the major company third grade postings.

The company which is expected to lead the rumored price reduction has no secondary company connection.

BUYING CONTRACTS
Valley Pipe Line Co. to purchase at Samfordyce

McAllen, Texas.—Duval Pipe Line Company has assigned its contracts for crude oil purchases in the Samfordyce field, Hidalgo County, to the Valley Pipe Line Company, which has a 65-mile five-inch line from the field to tidewater at Port Isabel.

The latter company is running about 3500 barrels of oil per day through this line, and is building a booster station near McAllen to increase the line's capacity to 6500 barrels per day. There have been 100 producers completed in the field to date, and its limits are not definitely defined, hence an increase in output is expected.

152 TEXAS STARTS

Austin.—Permits for the drilling of new wells in Texas as granted by the Railroad Commission continued to show a decline last week, 152 being allowed.

For the first time since its discovery, there were no permits allowed for wells in the East Texas field. Many applications for wells in this area are now on file awaiting final approval by members of the railroad commission, but each of these is an exception to the spacing rules.

North Texas reported 47 new locations, more than any other district. This included 17 wells in Wichita County and 12 in Baylor County.

Southwest Texas was second with 27 scattered locations, and there were 16 in the Gulf Coast.

East Central Texas listed 18 permits with 15 in Cooke County. There were 16 in West Central Texas.

CRUDE OIL PRICE QUOTATIONS

(Figures Represent Basic or Flat Prices—Revised to November 15, 1935)

DISTRICT	Low Grav.	Dif.	High Grav.	Date
Oklahoma-Kansas	28—$ .84	2¢	40—$1.08	9-29-33
N. and N.-C. Texas	28— .79	2¢	40— 1.03	9-29-33
Texas Panhandle				
Gray County	34— .79	2¢	40— .91	9-29-33
Carson-Hutchinson	34— .69	2¢	40— .81	9-29-33
West Texas				
Ector, Pecos, W'kler	*.75			9-29-33
Crane, Upton, Howard and Glasscock	*.70			9-29-33
East Texas	*1.00			9-29-33
Texas Gulf Coast				
Anahuac-Dickinson	30— .94	2¢	40— 1.14	8-20-35
Conroe	35— 1.09	2¢	40— 1.19	9-29-33
Tomball	*1.15			9-29-33
Cleveland	*1.00			1-11-34
†Goose Creek, Hull Liberty, Orange, Pierce Junction, Moss Bluff, Raccoon Bend, Sour Lake, Spindletop, Sugarland, West Columbia, Humble,	Below			
Rabbs Ridge	20— .82	2¢	34— 1.12	9-29-33
South and S. W. Texas	Below			
Refugio (Light)	20— .82	2¢	34— 1.12	9-29-33
Refugio (Heavy)	*.80			6-29-35
Saxet	*.80			6-29-35
Mirando	*.75			6-29-35
Pettus	*1.05			9-29-33
Salt Flat	*.87			9-29-33
Darst Creek	*.87			9-29-33
Port Lavaca	*.97			
Arkansas				
El Dorado (Light) and Rainbow	29— .79	2¢	40— 1.03	3-17-34
El Dorado East Field and Smackover	*.70			9-29-33

* All gravities—flat rate.
† GulfCoast prices as posted by Humble Oil & Refining Company.

DISTRICT	Low Grav.	Dif.	High Grav.	Date
North Louisiana	29— .79	2¢	40— 1.08	9-29-33
Urania	*.85-*.87			1- 1-34
South Louisiana	Below			
Lockport	20— .80	2¢	34— 1.10	9-29-33
Iowa, Cameron Mds.	Below 20— .70	2¢	34— 1.00	9-29-33
Rocky Mountain States				
Salt Creek	29— .84	2¢	40— 1.08	9-29-33
Elk Basin	*1.17			9-29-33
Grass Creek (Light)	*1.17			9-29-33
Big Muddy	*1.01			9-29-33
Rock Creek	*1.02			9-29-33
Sunburst	*1.20			7-19-35
Lance Creek	*1.02			8-25-33
Osage	*.62			8-25-33
Cat Creek	*1.07			8-25-33
Cut Bank	*1.45			9-29-33
Pondera	*1.05			9-29-33
Hog Back, N. M.	*1.00			9- 8-33
Lea County, N. M.	*.75			9-29-33
Mid-West States				
Lima	*1.15			2- 1-35
Illinois	*1.13			1- 5-34
Princeton	*1.13			1- 5-34
Western Kentucky	*1.13			5-22-35
Pennsylvania				
Bradford	*2.15			9- 6-35
Sw. Pa. Pipe Line	*1.87			9- 6-35
Eureka Pipe Line	*1.82			9- 6-35
Buckeye Pipe Line	*1.67			7-16-35
Corning Grade	*1.32			10- 2-33
Michigan				
Central Michigan	*1.12			11-7-35
Muskegon	*.70-1.00			12-31-32
Canada				
Petrolia	*2.10			9- 9-33
Oil Springs	*2.17			9- 9-33

* All gravities—flat rate.

MAJOR PRICE CHANGES

	Penna. (Nat. Tr.)	Mid-Cont. (36 Gr.)	Calif. (26 G.)
March 5, 1933			Cut 25
May 2, 1933		Cut 10	
May 9, 1933	Cut 20		
May 22, 1933	Up 10		
June 19, 1933	Up 10	Up 10	
June 26, 1933	Up 10		Up 9-10
July 6, 1933	Up 13	Up 10	
July 17, 1933	Up 15		
July 28, 1933	Up 15		
August 11, 1933	Up 10		
August 24, 1933		Up 10	
August 30, 1933	Up 15		
September 6, 1933	Up 10	Up 10	Up 15
September 8, 1933		Up 15	
May 1, 1934	Up 10		
November 6, 1934	Cut 25		
December 6, 1934	Cut 25		
January 4, 1935	Up 15		
February 4, 1935	Up 15		
May 16, 1935	Cut 15		
June 26, 1935	Cut 15		
July 16, 1935	Cut 10		
August 29, 1935			Reduced
September 6, 1935	Up 5		
October 29, 1935	Up 15		
November 1, 1935			Raised

CRUDE PRODUCTION TAXES

Oklahoma—Five percent of gross value less royalty interest.

Texas—Two cents or 2 percent, whichever is higher.

Louisiana—From four to 11 cents a barrel, depending upon gravity.

Arkansas—2.6 percent of gross market values.

Montana—Three percent of gross value at well and ½-cent per barrel.

Wyoming and New Mexico—Production tax based upon state and county assessments.

California—.66443 mills per barrel of oil produced and 17.39 cents per acre on proved oil lands.

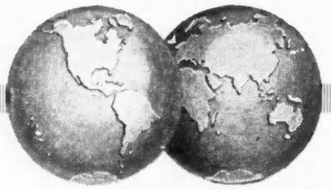
* All gravities—flat rate.

CALIFORNIA

(All gravities above those quoted take lowest price offered in that field Effective November 1, 1935)

Gravity	Signal Hill	Seal Beach Alamitos Heights	Huntington Beach	Inglewood	Playa Del Rey	Olinda-Brea Canon	Athens Rosecrans Dominguez	Elwood Terrace	Torrance	Richfield	Whittier La Habre	Montebello	Coyote Hills	Santa Fe Springs	Newhall McKittrick Kern River	Mountain View	Midway Sunset Elk Hills Buena Vista Hills	Lost Hills	Coalinga	Wheeler Ridge
14-14.9	$.75	$.74	$.73	$.74	$.75	$.71	....	....	$.75	$.71	$.71	$.72	$.72	....	$.65	....	$.65	$.65	$.65	....
15-15.9	.75	.74	.73	.74	.75	.71	....	....	.75	.71	.71	.72	72	....	.65	....	65	65	65	....
16-16.9	.75	.74	.73	.74	.75	.71	....	....	.75	.71	.71	.72	72	....	.65	....	65	65	65	....
17-17.9	.75	.74	.73	.74	.75	.71	....	....	.75	.71	.71	.72	72	....	.65	....	65	65	65	....
18-18.9	.75	.74	.73	.74	.75	.71	....	....	.75	.71	.71	.72	72	....	.65	....	65	65	65	....
19-19.9	.75	.74	.73	.74	.75	.71	....	....	.75	.71	.71	.72	72	....	.65	$.65	65	65	.65	$.65
20-20.9	.75	.74	.73	.74	.75	.71	....	....	.75	.71	.71	.72	72	....	.65	65	65	65	65	65
21-21.9	.75	.74	.73	.74	.76	.71	....	....	.75	.71	.71	.72	72	$.73	.65	66	67	65	65	65
22-22.9	.75	.74	.73	.75	.78	.72	....	....	.75	.71	.71	.72	.72	.73	.65	67	68	66	65	65
23-23.9	.75	.74	.74	.76	.79	.73	$.75	....	.76	.71	.72	.73	.72	.73	.65	69	70	67	65	65
24-24.9	.77	.74	.75	.77	.81	.74	.75	F.O.B. Ship	.77	.72	.74	.74	73	.73	.65	71	71	69	.65	65
25-25.9	.78	.75	.76	.78	.82	.75	.76		.78	.73	....	.75	74	.73	.66	72	73	70	.66	66
26-26.9	.79	.76	.78	.79	.83	.76	.77		.79	.74	....	.76	75	.73	.67	74	74	....	....	....
27-27.9	.80	.78	.79	.80	....	.77	.79		....	.75	....	....	77	.74	.68	76	76	....	....	....
28-28.9	.81	.79	.80	.81	....	.79	.80		....	.76	....	....	78	.75	.70	77	77	....	....	....
29-29.9	.82	.81	.81	.82		....	.82		....	.78	....	....	.79	.77	....	.71	79	.78	....	....
30-30.9	.83	.83	.82	.83		....	.83		....	....	....	....	80	.78	....	.72	.81	.80	....	....
31-31.9	....	....	....	.84		....	.84	....	....	Kettleman Hills			81	.79	....	.74	.83	....	....	....
32-32.9	....	....	....	.85		....	.86	....	....				82	.81	....	.75	.84	....	....	....
33-33.9	....	....	....	....		....	....	$.84	....		$.81		83	.82	....	.76	.86	....	....	....
34-34.9	....	....	....	....	F.O.B. on Pipe Line	....	....	.85	....		.83		.85	.83	....	.77	....	....	....	....
35-35.9	....	....	....	....		....	....	.86	....		.84		....	.85	....	....	....	....	....	....
36-36.9	....	....	....	....		....	....	.88	....		.86		....	.86	....	....	....	....	....	....
37-37.9	....	....	....	....		....	....	.89	....		.87		....	.87	....	....	....	....	....	....
38-38.9	....	....	....	....		....	....	....	....		.88		....	.89	....	....	....	....	....	....
39-39.9	....	....	....	....		....	....	....	....		90		....	....	....	....	....	....	....	....

WORLD DEVELOPMENTS and TECHNOLOGY



Edited by
WM. V. GROSS, Associate Editor

NORTHEAST MEXICO

Wildcatting again active after virtual shut-down

Wildcatting in Northeastern Mexico is again becoming rather active after a virtual shutdown of nearly a year. Three wildcats are drilling, a new test is rigging up, and one new location has just been staked.

One of the most interesting tests in the area is Ohio-Mex Oil Company's Rancherias 3, located about five miles southwest of Rio Grande City, Texas, but across the Rio Grande in Mexico. The well set and cemented 10-inch O.D. surface casing at 1910 feet and will test a reported oil and gas show between 1910 feet and 1954 feet, where the hole is bottomed. The following gas shows were reported: 276-90 feet, tested 11,500,000 cubic feet daily; 1280-1304 feet, tested 40 million cubic feet daily; 1332-50 feet, made show of oil and tested 39 million cubic feet daily; 1462-1552 feet, good oil show and estimated probable greater gas production than the other sands.

Continental Oil Company of Mexico's Zacate 4, 30 miles southwest of Reynosa, Tamaulipas, Mexico, reported slight gas shows around 3500 feet but drill stem test yielded nothing. The test is now drilling below 4070 feet. A highly interesting sand section showed in 14 cores between 2350 and 2450 feet. Drill stem test at 2327-50 feet showed a little gas, some oil and 150 feet of salt water. Mud and a show of oil was reported on drill stem test at 2406-53 feet. Drill stem test at 3509-25 feet showed gas and a small amount of free, high gravity oil. Drillers expect the pay around 4700 feet.

About one mile west of the town of Mier, Tamaulipas, and eight miles south of Roma, Texas, Mier Oil Company's Cia Carbonifera de Mier, S.A., 1, in the south half of Porcion 42, Community of Mier, is temporarily shut down at 1720 feet. Drill stem test of a break at 1610 feet showed nothing. Contract is 3500 feet.

Cia. Mexicana de Petroleo "El Charro", S.A., has announced awarding of contract to Sheldon & Burden, contractors, for Rio Bravo 6, 23 miles southwest of Reynosa, and south of the Reynosa-Monterrey highway. Rig is being moved in to location northwest of other wells drilled during recent years on the Rio Bravo lease.

Cia. de Petroleo Mercedes, S.A., which has drilled several other tests in Northeastern Mexico, has staked location for the Santa Gertrudis 1, in the southeast end of Porcion 20, Ancient Jurisdiction of Camargo, about 18 miles southeast of Rio Grande City, Texas. Location is on the Santa Gertrudis Ranch and on what is considered a very likely prospect. Contract has not been awarded.

They're TOUGH . . . They're tough on lathes; tough on threading equipment; tough on forging dies; tough on the men that make them; tough on cutting tools. . . .

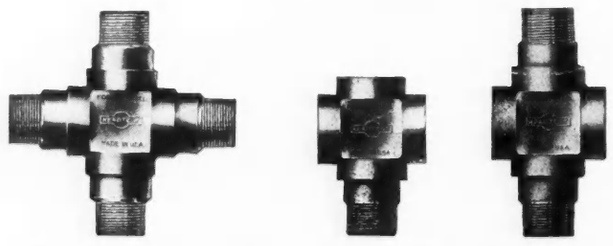
They're built for tough service . . . A steel fitting must be tough to be good.

They're harder to make than fittings "hogged" out of soft steels . . . and that's why it takes a plant like KEROTEST to turn out this kind of fitting.

They'll stand higher pressures than will be encountered in the oil and gas fields for many years to come.

Carefully machined and threaded to API standards, made from tough forging steel and heat-treated to give well balanced physical properties, . . . These fittings are made for your high pressure connections where shock loads are always present.

Write for Bulletin 115 . . . it contains complete information.



6000 Pound Test Drop Forged Steel Fittings

They're Tough!

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AREA BEING MAPPED

Ideas of Western Australia will undergo changes

Freney Kimberley Oil Company (1932), No Liability, is conducting an aerial mapping campaign in Western Australia which will not only alter the existing maps considerably but will clear up many problems and add extensively to geological knowledge of that area, according to a letter received recently by THE OIL WEEKLY from Perth, Western Australia.

Aerial mapping in Western Australia, particularly in the area being worked on the Freney Kimberley Oil Company, is hazardous. The country is very rough and unsettled, and forced landings are almost impossible in most parts of it. A haze of red dust filling the air immediately above the surface of the earth often renders it necessary, according to THE OIL WEEKLY'S communication, to take pictures of the same area several times before a usable one is obtained.

DEEP TEST DELAYED

Maturoa Company plans in New Zealand indefinite

Plans for a deep test in New Zealand by Moturea Oil Fields, Ltd., have not materialized, according to a letter received by THE OIL WEEKLY recently.

From the standpoint of drilling activities, New Zealand, both on the north and on the south island, has been very inactive for the past 12 months. Gross production around New Plymouth is being obtained from three small wells, one of which is pumping 10 barrels per day and the other two of which are flowing an aggregate of seven barrels per day. The oil, however, is of paraffin base and of high quality.

According to THE OIL WEEKLY'S communication, there is no prospect of immediate drilling of any consequence in New Zealand.

IRAN OUTPUT

A gross production of 52,374,000 barrels is anticipated for Iran for 1935, based on performance of fields in that country for the first eight months of the year.

Production in August in Iran amounted to approximately 4,634,000 barrels, bringing the total oil recovered in Iran during the first eight months of 1935 up to 34,496,000 barrels.

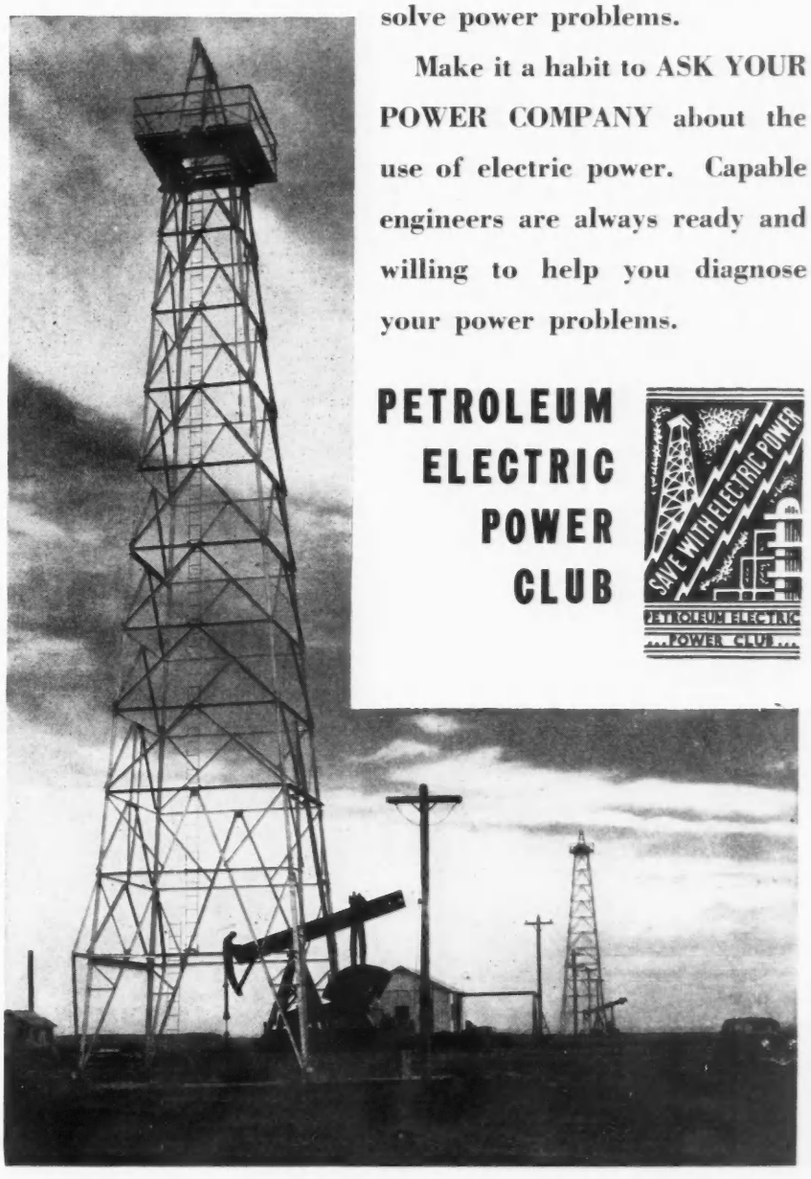
Exploratory drillings of the Directorate of State Mines at Slatine Doly in the Jasina region of Czechoslovakia have been abandoned, according to a letter received by THE OIL WEEKLY from Prague recently. The Czechoslovakian Ministry of Public Works considers wildcat information as a state secret; hence, further details on the project are not available at this time.

DIAGNOSIS FREE

PURCHASED ELECTRIC POWER always has advantages that a careful oil man wants to consider.

ANY POWER PROBLEM, however simple it may appear, deserves very careful consideration. It involves questions of economy, efficiency and safety. Snap judgment does not solve power problems.

Make it a habit to ASK YOUR POWER COMPANY about the use of electric power. Capable engineers are always ready and willing to help you diagnose your power problems.



PETROLEUM ELECTRIC POWER CLUB

Federal Control

[*Continued from page 9*]

are in danger of early exhaustion, that the industry has been wasteful and unwilling or unable to cooperate in their conservation, and that rigorous governmental control, or making the industry a public utility, is necessary. Declaring that the industry previously has been called upon to dispel fears about the available supply of petroleum, the report recalls that in 1925 a similar study was undertaken by the institute.

President Byles in his address stated that if left as an industry free of bureaucratic control, petroleum is capable of providing motor fuel and lubricants for the people of the United States for as long as there are natural resources capable of being converted into energy for the internal combustion engine.

Concerning reserves, Byles said:

"The current survey, which gives careful consideration to the various items affecting demand, indicates that in 1950 we will require a daily crude oil production of 3,041,000 barrels, this demand declining by 1960 to 2,926,000 barrels per day."

Interstate Compact Boosted

The interstate oil compact came in for favorable mention in several instances. President Byles declared that there is no power under the federal constitution for the federal government to control the production of oil which is mining, any more than the refining of oil, which is manufacturing. That power, he said, is reserved to the states.

In the interstate compact the petroleum industry has its opportunity to accomplish conservation, stabilization and avoid federal control. This was the basis on which the compact was presented to the oil men at the meeting by Tom Anglin, speaking for Governor E. W. Marland of Oklahoma, chairman of the interstate oil compact commission. Ernest O. Thompson, chairman of the Texas Railroad Commission, reiterated these views in his address on the purpose and operation of laws prorating oil production.

Proration Difficulties Heard

After recounting the history of proration by state regulatory bodies, especially Texas, Colonel Thompson expressed the opinion that the threat of federal control has passed. He explained that legislation is enacted only in response to an insistent demand and that the cry for oil control acts has now ceased. Continuing, Thompson declared that changes in the economic status of the industry as well as the nation were given as another reason why there will be no further agitation for federal control.

Difficulties of state regulation were classed by Thompson as coming from two sources. One is that the conservation statutes are written by legislators, who have the whole of the voting public rather than the oil industry's personnel as their constituency. The other is a small group of oil producers who are not satisfied with proration orders and seek relief through the courts. When checked, these men turn to violation of both regulations and decisions of the courts.

California Problems

"Five men could sit down at lunch and in an hour agree upon an operating method by which the wasteful methods at Kettleman Hills North Dome could be halted and one of the valuable oil deposits of California conserved." Such was the charge hurled by A. L. Weil, president of General Petroleum Corporation, as a part of his summary of conditions on the West Coast. Weil took the place of Charles S. Jones, president of the California Oil & Gas Association.

He gave figures to show how conditions have changed in 10 years. In 1924 daily California production was 635,000 barrels, while today it is 636,000 barrels, but stocks have been reduced 37,000,000 barrels. Consumption 10 years ago was 1,100,000,000 gallons a year, and for 1935 will be close to 2,100,000,000 gallons.

Weil expressed the opinion that there is no hope of a California conservation statute within the next few years. Defeat of the Sharkey bill two years ago was presented as an indication that it is not logical to expect legislation of this nature.

All in all, the sixteenth annual meeting of the American Petroleum Institute may be summed up as one of the most successful in the history of this big organization. Better feeling over future conditions was an outstanding feature of all discussions.

Entertainment presented for both the men and the ladies was of the highest type. One man, speaking of the annual banquet, said, "In 14 years of attending the American Petroleum Institute, I have never seen as fine talent or as well organized banquet as this one." From remarks by others, he apparently was expressing the opinion of everyone.

Committee Work

[*Continued from page 9*]

even tentative standardization plans are drawn. It will be very difficult to standardize because of the wide variance in ground conditions, it was disclosed. As many as 23 styles of substructures are being used, and both the manufacturers and oil companies are finding it difficult to meet repairs and additions.

This committee also discussed derrick lighting as a problem. One Gulf Coast company through a long series of experiments was able to increase the intensity of the light on the derrick floor by 200 percent. This was accomplished with ordinary 150- and 200-watt light bulbs. Proper arrangement of the lights eliminated shadows and gave an almost uniform distribution of light.

Intense interest was shown at the Monday morning meeting of the special sub-committee on CD rod pumps. The technical sub-committee of the California Oil Well Pump Manufacturers Association also sat in this meeting. The largest conventional pumps now falling under the standardization plan is the four-inch type, but it was indicated that the five-inch and six-inch types may be required for pumping oil under certain conditions.

The topical committee on production nomenclature met Monday morning and considered a long list of names and terms used in connection with drilling and production practices. Addition of a large number of terms was recommended, and several changes were made to conform with recent developments.

Saturation of producing formations and the action of oil, gas and water in zones featured the meeting of the topical committee on development and production research. The response of reservoir to various producing conditions and the effect of rapid oil withdrawals were considered.

Allocation

The topical committee on allocation of production met Tuesday morning and spent most of the time discussing allocation as shown by the productivity index. Members failed to agree on the merits of the system under consideration, but decided finally that out of the efforts of the past year an equitable allocation method can be found. The The productivity index is the number of barrels produced per pound drop in bottom-hole pressure. The measurement is ordinarily a true index of the relative ability of the producing formation to yield oil without regard to the size or design of the physical equipment of the well.

The question of the number of wells drilled on given units was considered, but it was agreed that an allotment based on the amount of oil in place is a more equitable basis than an allotment based on the number of wells or the well potentials. Fred E. Wood was chairman of this meeting.

Well Spacing

The topical committee on well spacing held its meeting Tuesday morning. It was explained that none of the formulas advanced in the past had been proved, and that little was known of the relative worth of the various methods outlined in articles during the past four years. Considerable doubt was expressed as to the solution of the problem in a given time.

A representative of the Bureau of Mines stated that his department would give a large part of its time and appropriation toward the formulation of a well spacing plan or formula that would apply to the various districts. He recommended that producing companies make experiments in an effort to establish pressure gradients that would give definite clues.

Chairman R. D. Wyckoff stated it was his observation that conservative spacing was better than close spacing for the preservation of pressure and favorable gas oil ratio.

The Bureau of Mines representative stated that this branch of the government will spend a considerable part of a $100,000 fund allotted to research in the study of well spacing. A motion was made to ask the Institute to appropriate a sum of money for use in connection with the work of the Bureau of Mines, but the motion was withdrawn.

A number of the committee members expressed the belief that several years of research would be required to find a well spacing formula that would be effective and efficient. Drainage, formation conditions and a dozen factors enter into the problem, and it was

agreed that a straight acreage basis might not prove equitable.

At a meeting of the special sub-committee on sucker rods, several changes in standardization were recommended. In the one-inch rod size, box and pin type only, the coupling will be 2-3/16 inches in diameter, the pin 1⅜ inches in diameter, 10-thread, and 1¾ inches long. In the five-eighth-inch, three-fourth-inch and seven-eighths-inch rod sizes, the old standardized "flats" were 1⅜ inches for all sizes. The new recommendation is 1⅜ inches for the five-eights-inch size, 1½ inches for the three-fourths-inch size and 1⅝ inches for the seven-eighth-inch size.

Source Beds

Several important decisions were made Wednesday morning at the meeting of the advisory committee on fundamental research on occurrence and recovery of petroleum. In a discussion led by Parker D. Trask, U. S. Geological Survey, the results of a long series ef experiments to determine the identity of source beds were disclosed. It was indicated that if two percent of the organic matter in the drainage area of an oil field is transformed into oil and migrates to the field, the structure will be a good producer. The percentage of accumulation of oil caused by the transformation of sediments in drainage areas varies sharply, it was shown. The tendency toward increased accumulations in basins was pronounced and the effect of ridges on uniform accumulation was noticeable.

In the East Texas district, the source beds probably lie below the lime beds, a number of geologists agreed. It was found that all the shales in the East Texas field that are regarded as source beds were rich in organic matter.

Little work has been done toward the determination of source beds, and it is very important in the search for new fields and in calculating the influence of migration that these beds be considered.

Some of the members thought that there may be a critical pressure and temperature at which matter becomes oil or goes back to gas from oil. It was admitted that it may be wrong to assume that beds under consideration are true source beds, but it is necessary to start from some point in the research work.

It appears that the migration to the structure involves a greater area than ordinarily believed. Research in the past has indicated that very few sediments contain more than two percent organic matter. About half of the sediments are source beds and half are not, but the average may run higher or lower. These averages apply to samples taken around producing fields.

Very little work has been done toward determination of water action as the oil is withdrawn from the structure. Replacement of water in the sand was considered important, however. One member said that the water drive in the East Texas field was so important that a better understanding of its nature might increase measurably the ultimate production from the field.

An additional fund for continuation of the research work done in the past was discussed, and several members favored asking for an appropriation. The original work was divided among a number of institutions, but progress was slow and results doubtful, it was shown.

The central committee on measuring, sampling and testing natural gas and natural gasoline met Wednesday afternoon, with F. E. Rice as chairman. The parent committee accepted the reports of two sub-committees, one recommending a standard of measurement and analysis for natural gas and another recommending the same for natural gasoline.

The correlating committee on measuring, sampling and testing crude oil met Thursday morning, with W. R. Trelford as chairman. The subject claiming most attention was the standardization of tank tables. Wide differences in tank measurement practices in the various districts presented such a problem that little progress was made.

In Texas it was disclosed that one company purchasing and handling 35,000,000 barrels of crude oil annually had a 119,000-barrel loss after deducting the one percent evaporation loss claimed against the seller. This seemed to have been caused by basic sediment and water that appeared after oil was purchased. This loss indicated inefficiency of correction tests.

California uses the 100 percent tank table, while Texas and most of the Mid-Continent uses the 99 percent table. The former, however, charges the producer an agreed percentage for evaporation.

The luncheon and meeting Thursday noon of the central committee on district activities brought out that California and the Mid-Continent are not following similar courses in their vocational training work, although each has at one time tried the other's plan. California is giving more advanced courses in its work, while the Mid-Continent is holding to a basic course because of limited funds.

Economies of Pumping

[*Continued from page 44*]

facilitate selection of equipment suited to the particular job.

In order to secure good pump volumetric efficiency throughout the life of the well, pumping installations should be so designed that progressive changes in speed can be made with a minimum of expense and trouble. Double-reduction gears have been extensively used for this purpose. Speed ranges from 24 strokes per minute down to less than two strokes per minute can be provided by changing V-belt drive ratios from one-to-one to seven-to-one, and by varying the speed of the prime mover from 1200 r.p.m. to 600 r.p.m.

3. *Power*—Power input to a rig is about proportional to the pump displacement—regardless of the amount of oil pumped; and, therefore, volumetric efficiency of the pump should be kept high. Below-ground power efficiency, even with no excess pump displacement, averages only about 50 percent. Standard rig efficiencies reach a maximum of about 78 to 80 percent, but only when heavily loaded. Motor efficiencies and, therefore, power inputs vary considerably with amount of counterbalance, as shown by the following example on a Buckbee Zone well at Santa Fe Springs: Fourth hole pumping with correct counterbalance was changed to third hole. Before counterbalance was adjusted for the new condition, power input to motor was 14.6 horsepower, and after changing was reduced to 11.2 horsepower.

New pumping installations are being powered with either electric motors or multi-cylinder gas engines. The durability and small maintenance cost of electric motors are well known. Multi-cylinder engines are newer, and representative maintenance costs as well as length of life are not so definitely known—although some engines have had continuous service for three years and still appear to be in good condition. It is important that the prime mover should be of the right size. Figure 5 shows the efficiency curve of an electric motor. It is to be noted that, at higher loads, the motor is most efficient; that efficiency is reduced slowly with first reductions in load, but that with smaller loads the efficiency drops off very rapidly. A substantial saving will usually be made when the load falls to the low-efficiency range to replace the large motor with a smaller one. Size of gas engine in relation to its load is also important, but for another reason. Moderate loading will greatly increase its life over full-load operation, and also result in economy in fuel. Amount of gas used is not as important with engine operation as is amount of electric energy for a motor, due to the great difference in cost. Table 2 shows the difference in cost of gas and electric energy, and with estimated efficiencies the cost per month per brake horsepower. Assuming at a certain lease that gas is worth six cents per 1000 cubic feet, and that electricity can be furnished for an average cost of one cent per kwh, a 20-horsepower load will cost $176 per year for gas and $1517 per year for electricity. Use of gas will allow $491 to be applied on maintenance and operating profit each year, while permitting the junking of an $850 engine annually, if it is completely worn out.

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COMMITTEE MEETING

Elaborate tax program to be mapped at Dallas

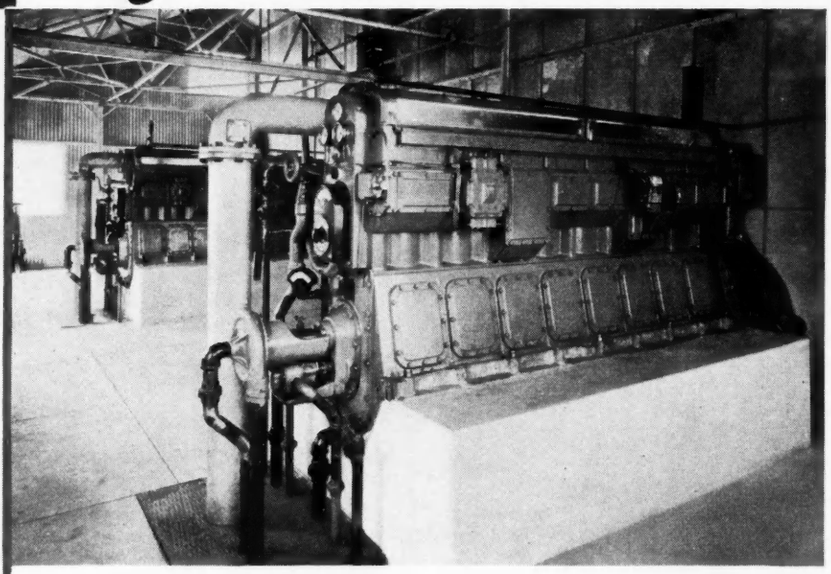
The Mid-Continent Oil and Gas Association's standing committee on state and local taxation will hold its annual convention at Dallas on December 4, 5 and 6. It will be presided over by Glenn E. Thompson, attorney and tax department head of the Tide Water Oil Company, with John Campbell as secretary.

Dallas will also entertain on these same days the federal income and excise tax committee of the Empire companies, according to F. B. Plank of the association at Bartlesville.

The discussion and planning of an extensive tax program with advice and help to oil companies of the association embracing six states is the proposed purpose of both committees.

OIL for the lines of Oklahoma

PUMPED BY MODERN GAS ENGINES



A lot of power in a small space! In this new pumping station at Ada, Oklahoma, two modern COOPER - BESSEMER Type EN-8 vertical gas engines are direct-driving oil-line pumps through step - up gears. Each engine is rated 300 H. P. at 625 r. p. m.

TYPE EN gas engines are eminently suited for this service. They combine brute strength with compactness and light weight. They have the rugged Diesel-type construction throughout; for instance, the large-diameter crankshaft and the big crank web that eliminate all dangerous criticals. Type EN's are inexpensive to install on minimum foundations, in a small building. Find out more about Cooper-Bessemer's modern line of Diesel and gas engines for all pipe-line services. Learn in detail how Cooper-Bessemer employs better materials, better designs, and closer inspections to safeguard your investment . . . minimize shut-downs . . . reduce costs of operation and maintenance.

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Magnolia Bldg., Dallas, Texas
225 Crockett St., Shreveport, La.
201 East First St., Tulsa, Oklahoma

Less Field Work

NEW LOCATIONS LAG BEHIND COMPLETIONS IN OKLAHOMA

WEEKLY STAFF REPORT

Tulsa. — Inclement weather took a noticeable toll on Oklahoma field activity during the week when scouts made only 37 first reports and 43 tests were completed.

Pontotoc County, under the influence of the Fitts pool, retained its lead with seven first reports; Hughes and Osage Counties were tied for second with four first reports each; Seminole and Stephens Counties had three each; Creek, Lincoln, Oklahoma, Pawnee, and Payne Counties, two each; and Carter, Jackson, Noble, Okfuskee, Okmulgee and Pottawatomie Counties, one each.

The 43 completions included 22 oil wells with a combined initial of 19,859 barrels, one gas well with initial volume of 3,000,000 cubic feet, 17 dry holes, and three abandoned locations. The development records show four wildcat dry holes to have a combined footage of 7522 feet, four old wells were deepened 1045 feet and the 35 remaining completions accounted for 93,343 feet, a total of 101,910 feet of completed drilling.

Carter Oil Company et al are still trying to free the drill pipe in Williams 1, SW NE SW 27-2s-3w, important find in the old Fox field of northwestern Carter County. This test showed for gusher production from 8088 feet, presumably in the Simpson formation, and has created one of the most intensive lease plays that southern Oklahoma has experienced in several years. It is reliably reported that Gypsy Oil Company is planning a deep test on the Fitzgerald farm in the W½ E½ 28-2s-3w, approximately one-half mile west of the deep discovery.

Virgin Area

Sixteen miles west of Marietta in western Love County Sinclair Prairie Oil Company had decided to drill ahead in its Stockton 1, SE SE SW 26-6s-2w, 12 miles southwest of the nearest production and in an area about which practically nothing is known, geologically. Sand cored from 6553 to 6573 feet and reported well saturated was indicated as water bearing by an electrical logging device.

Five miles northeast of Marietta in northeastern Love County Stanolind Oil & Gas Company and Amerada Petroleum Corporation's Westheimer and Daube 1-A, SW SE SW 27-6s-2e, had Misener sand at 2100 feet, went into Simpson formation at 2108 feet and was coring below 2445 feet. Another show of oil was encountered at 2435 feet.

Attention was turned early in the week to the old Cement area of southeastern Caddo County when Ray Stephens, Incorporated, et al's Melton 1-A, SW SW SE 26-6n-10w, started flowing at the estimated rate of from 15 to 20 million cubic feet of dry gas from sand topped at 5111 feet and penetrated to 5169 feet after cementing seven-inch casing at 5115 feet. After the well had blown for a short period the gas started getting wet and showing signs of making some oil. Late in the week it was reported still open and the oil showing an increase. It is slightly less than a half-mile west of a dry gas well in the western edge of the West Cement pool and about two and one-quarter miles northwest of Marathon Oil Company and Ramsey Petroleum Corporation's Culp 6, which was drilled to 10,079 feet several years ago and established a depth record for Oklahoma at that time. Acreage upon which the test is being drilled was formerly owned by Marathon and Ramsey.

Oklahoma City. — Determination of market demand for Oklahoma oil during December and the allocation of this demand to the various pools will be made in a hearing before the corporation commission on November 26. During the morning and preceding the hearing the chief conservation officer and his staff will meet with the operators and purchasers to discuss recommendations in regard to demand and allocation. It is anticipated that the change in allowable will be very small.

Fitts Pipe Line Runs

Cumulative pipe line runs from the Fitts pool of southeastern Pontotoc County as of November 1, 1935, were reported to have been 5,238,000 barrels. Of this Stanolind Pipe Line Company handled 4,250,000 barrels and Oklahoma Pipe Line Company 988,000 barrels.

Fitts pool had the highest potential rating of any northern Mid-Continent pool on November 1, when 202 wells were rated at 601,500 barrels per day. All potentials are taken through 2½-inch tubing after the wells have been required to blow down any shut-in head, so it seems highly probable that the pool actually could exceed its potential if permitted to flow to capacity. The structure is losing formation pressure at a very low rate and is one of the most highly efficiently operated pools in the Mid-Continent area.

The first test to be abandoned in the Fitts pool was plugged this week when E. H. Moore et al's Benton 3, NW SW NW 32-2n-7e, on the south edge of the pool, was given up as dry. This test is a south offset to the same operator's Atkins 3, which made a large well in the Wilcox sand and is the only well which so far has been drilled to that horizon on the Fitts structure. Benton 3 went directly from Woodford shale into Arbuckle limestone at 4963 feet and drilled to 5230 feet with nothing showing. All beds between those markers were cut out by faulting which apparently defines the southern limit of Wilcox sand production at this point.

OKLAHOMA CITY POOL

24-hour potential of 960 wells is 433,605 barrels

Oklahoma City.—As of November 1, 1935, the 960 wells permitted to produce in the Oklahoma City pool had a combined 24-hour potential rating of 433,605.49 barrels per day. Of this amount 545 Wilcox sand wells were rated at 400,379.06 barrels per day; Simpson Below Wilcox, 358 wells rated at 26,935.19 barrels per day; and 23 Cleveland sand wells, 6,291.24 barrels per day. The 34 Arbuckle lime wells were allowed to produce to capacity and have no potential rating.

Phillips Petroleum Company had the greatest potential rating with 167,289.03 barrels from 131 wells; Indian Territory Illuminating Oil Company was second with 63,269.53 barrels from 296 wells; and Carter Oil Company was third with 30,881.62 barrels from 59 wells. The potential of Westgate Oil Company was noteworthy with 24,345.31 barrels from only 13 wells.

October pipe line runs from the pool were 4,279,048 barrels, a daily average of 138,034 barrels, compared to October production of 4,230,855 barrels, an average of 136,480 barrels. Gross stocks as of November 1 were reduced to 625,836 barrels. The cancellation of 768,709 barrels underproduction left an underage as of November 1 of 314,629 barrels and an overage of 402,301 barrels, a net overage of 87,672 barrels. Net allowable pipe line runs for November are 4,662,806 barrels, an average of 155,427 barrels per day.

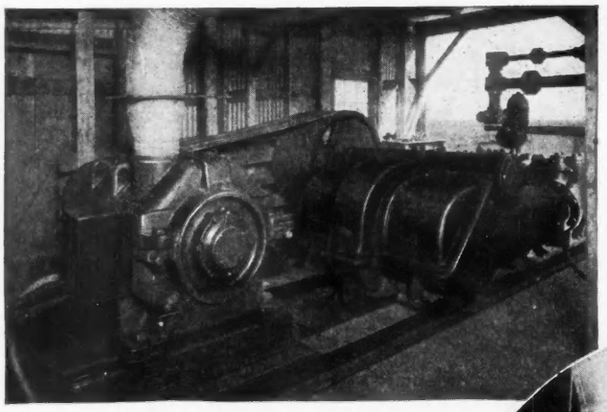
MEN MUST REGISTER

Oklahoma engineers are now forced to qualify

Oklahoma City.—Under an act passed by the fifteenth session of the Oklahoma Legislature and effective May 13, professional engineers, practicing within the state, are required to submit evidence of qualification and obtain registration to practice. The act which became effective on May 13, 1935, provided a six months period for such submission and registration. This period expired on Wednesday, November 13.

Fees

The board, upon application on the form prescribed by it, and upon the payment of a fee of 25 dollars, with certain exceptions, shall issue a certificate of registration as a professional engineer to any person who submits evidence, satisfactory to the board that he or she is qualified to practice professional engineering.



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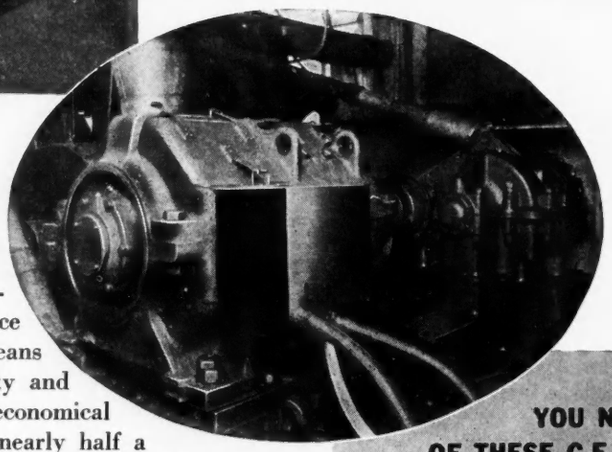

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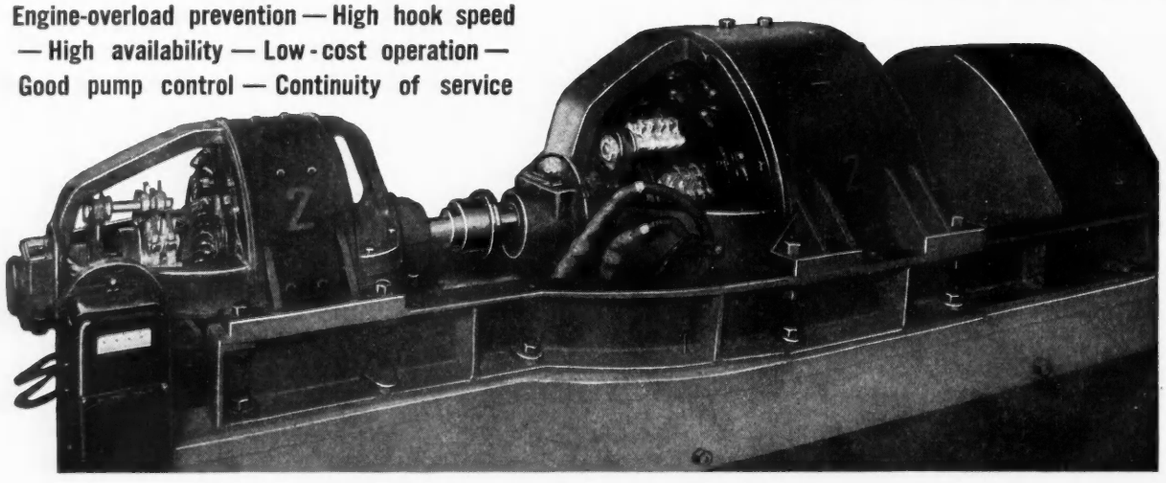


008-20

GENERAL ELECTRIC

OKLAHOMA
Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
ATOKA COUNTY—		
Boukans' Howard 1, nw sw nw 20-2s-10e	*	1135
BECKHAM COUNTY—		
Martin et al's Hood 1, cne nw 7-8n-23w	*	2562
BLAINE COUNTY—		
Earl Ingrham et al's Masters 1, sw nw nw 27-16n-11w	*	1320
CARTER COUNTY—		
Coline Oil Corp.'s Willis 15, ne ne se 6-4s-3w	27	1275
COMANCHE COUNTY—		
Bacon et al's Fahy 2, nw sw sw 21-2n-10w	*	903
CREEK COUNTY—		
North et al's Harry 1-A, cwl ne nw 4-15n-8e	*	1655
Riverland Oil Co.'s Burgess 1, sw sw sw 32-15n-9e	*	3685
Mid-Continent Pet. Corp.'s Stewart 30, nw nw se 15-17n-7e	24	2952
Sinclair Prairie Oil Co.'s Micky 6, se se sw 33-18n-7e (pb 1890)	*	2580
HUGHES COUNTY—		
Fitzpatrick's Dixon 3, sw sw ne 12-9n-8e	222	1762
Manahan Oil Co.'s Dixon "A" 2, se sw nw 12-9n-8e	760	1765
JACKSON COUNTY—		
Gypsy Oil Co.'s Circle 2, sw nw nw 11-1n-20w (pb 1300)	*	1668
Burke Royalty Co. et al's Minor "A" 3, se ne ne 15-1n-20w	42	1455
KIOWA COUNTY—		
Gilbreath et al's Shirlo 1, ne ne se 28-7n-20w	lcn.	abd.
LOGAN COUNTY—		
Sinclair Prairie Oil Co. et al's Glenn 1, ne ne se 27-15n-3w	*	6418
NOBLE COUNTY—		
Twin State Oil Co.'s Pfeiffer 1, nw nw sw 33-20n-2w	lcn.	abd.
OKLAHOMA COUNTY—		
Keaton et al's Rowland 1, nw ne ne 18-3s-10e	*	850
Phillips Pet. Co.'s Troy 1, sw sw ne 26-12n-3w	*	6585
OKMULGEE COUNTY—		
Hash's Harris 1-A, nw ne se 1-14n-14e	*	1704
OSAGE COUNTY—		
Midco Oil Corp.'s 4, se se sw 24-21n-8e	*	2460
National Ref. Co.'s 1, se se ne 11-24n-7e	*	2946
Sinclair Prairie Oil Co.'s 1, sw sw ne 15-24n-7e (pb 2489)	*	2912
Peters Pet. Co.'s 9, nw se nw 32-24n-9e	602	2483
Carter Oil Co.'s 8, se ne se 3-25n-6e	973	2853
Rock & Latham's 3, ne ne sw 2-28n-10e (pb 740)	2	1150
PAYNE COUNTY—		
Amerada Pet. Corp. et al's Jones 1, sw sw sw 27-19n-3e	983	4316
PONTOTOC COUNTY—		
Moore's Craddock 4, sw sw sw 29-2n-7e (otd 4069)	2475	4333
Moore's Craddock 8, se sw sw 29-2n-7e	¶2½-3572	4322
Atkins 1, nw nw nw 32-2n-7e (otd 4048)	¶4½-2979	4317
Atkins 2, ne nw nw 32-2n-7e (otd 4035)	¶4-3557	4293
Mexhoma Oil Co.'s Butler 3, sw sw sw 21-5n-8e	20	827
POTTAWATOMIE COUNTY—		
Superior Oil Co.'s Long 1-A, ne nw ne 5-6n-4e (pb 4320)	45	4350
Maud Oil & Gas Co.'s Smith 1, ne ne sw 2-7n-4e (otd 4118)	*	4372
Stewart & Egan's Brister 3, sw nw ne 28-7n-4e	20	4135
Tom Phillips' Bynam 1, se sw nw 26-11n-6e	864	4150
SEMINOLE COUNTY—		
Gypsy Oil Co.'s Factor 2, nw ne se 14-6n-5e	558	3830
Mid-Continent Pet. Corp.'s Gassaway 4, nw se ne 14-6n-5e	lcn.	abd.
Turman Oil Co.'s Factor 1, ne nw se 14-6n-5e	394	3800
Empire O&R Co.'s Davis "B" 4, se se ne 30-7n-8e	572	4128
Wood Oil Co.'s Templeton 1, nw se sw 28-9n-6e	879	4140
Magnolia Pet. Co.'s Browning 3, cw½ se nw 14-10n-6e	286	4159
STEPHENS COUNTY—		
Prince Bros.'s Williams 1-A, csw se 19-2n-8w	*	2505
WAGONER COUNTY—		
Greer et al's Riger 2, nw sw sw 11-17n-15e	¶3	1125

*Failures; †Junked; ¶Million cu. ft. gas.

Winter Is Felt

KANSAS DRILLING RETARDED BY UNFAVORABLE WEATHER

WEEKLY STAFF REPORT

Wichita, Kan.—Ice covered roads and leases made oil field transportation exceedingly difficult during most of the week in Kansas, and as a result many operations were shut down and a large number of the exploratory tests which remained under way were not visited by the scouts. The reports are, therefore, very incomplete and not representative of actual conditions.

Only 12 first reports were made from seven counties. Barton County had a very slight lead with three new operations; Greenwood, Stafford and Sumner Counties, had two each; and Cowley, Kingman and McPherson Counties, one each. This is the smallest number of first reports made during any week in 1935.

Of the 19 completions, 13 were oil wells which added 7504 barrels to the state's cumulative initial production, five were dry holes and one was an abandoned location. Cowley County was the only area in the state to score a discovery during the week when one well was completed at 3348 feet for 30 barrels initially. Three other wildcat tests were dry holes with combined total depths of 10,795 feet and the remaining 15 completions added 38,975 feet, a total of 53,118 feet of completed drilling.

Lario Oil & Gas Company and Barnsdall Oil Company's Wenrich 10-A, C NE NW 23-32s-2e, in the southeastern portion of the Oxford pool near here, encountered Simpson dolomite pay at 2831 feet, drilled to 2835 feet and flowed a 24-hour potential of 22,115 barrels. Gauges the first five hours upon which the potential was determined were 1071 barrels, 987 barrels, 960 barrels, 1008 barrels and 1013 barrels, a total of 5039 barrels. It is the third largest well in the old pool.

Helmrich, Payne et al had completed cellar and were drilling a water well at No. 1, C NE 11-3e-25w, 12 miles west of here and one mile southeast of the town of Reager in western Norton County. This will be the northernmost operation in Kansas and the first oil test for Norton County. Details have not been made available as to size of the block, contract depth or ownership.

NEW WEATHERED POOL
South offset to field's discovery well showing

Winfield, Kansas.—Lloyd, Frost and Study's Carson 1, NW NE NE 33-31s-3e, south offset to the discovery well in the newly discovered Weathered pool of northwestern Cowley County, topped siliceous lime at 3349 feet, and had a hole full of oil, with the lime just scratched.

COMMISSION HEARING

Wichita, Kansas.—Hearing has been called by the Kansas Corporation Commission in the Broadview Hotel here on November 22, at which time a discussion will be had on present plans for taking potentials. Since it is a general hearing any other problems of state production control will be in order. Among the plans to be discussed is that of the adoption of production decline curves where possible in lieu of physical tests in determining potential ratings.

KANSAS
Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
BARTON COUNTY—		
Lario Oil & Gas Co.'s Peter 1, nw nw nw 24-20s-11w	1392	3291
BUTLER COUNTY—		
Emerich's Heorman 1, sw sw sw 20-26s-3e	*	1250
COWLEY COUNTY—		
Shawver et al's Simons 1, ne nw se 29-30s-3e	*	3310
Markham, Wakefield et al's Hower 1, se se ne 32-33s-3e (pb 3338)	30	3348
ELLSWORTH COUNTY—		
The Texas Co.'s Becker 1, ne ne se 26-17s-10w	199	3265
Skelly Oil Co.'s Dees 7, nw se sw 14-17s-9w	969	3188
Phillips Pet. Co.'s Melchart 4, nw se ne 23-17s-9w	881	3200
GREENWOOD COUNTY—		
Sinclair Prairie Oil Co.'s Martindale 1-B, nw se se 30-23s-10e	*	2327
Lyke et al's Hillman 3, se ne ne 35-23s-11e	15	1888
Harwood Oil Co.'s Moore 1, ne nw se 23-24s-9e	*	2262
PRATT COUNTY —		
Skelly Oil Co.'s Maxedon 1, se se nw 25-27s-11w	242	3457
RENO COUNTY—		
Stanolind-Amerada's Hilger "A" 1, ne ne sw 21-26s-4w	*	4194
RICE COUNTY—		
Sinclair Prairie Oil Co.'s Volkland 8, nw sw se 20-19s-9w	213	3252
Mid-Continent Pet. Corp.'s Hartle 3, ne sw nw 15-20s-9w	922	3228
RUSH COUNTY—		
Darby Pet. Co.'s Jacobs 1, sw sw nw 3-16s-19w	lcn.	abd.
RUSSELL COUNTY—		
Hartman & Blair's Rouback "A" 2, ne se nw 2-14s-15w	782	3119
SEDGWICK COUNTY—		
Dickey Oil Co.'s Brown 4, sw nw ne 20-28s-1e	183	3117
Lauck et al's Jordan 3, nw nw se 6-28s-1w	1448	3670
SUMNER COUNTY—		
Shawver's Barlow 1, nw sw ne 33-31s-1w	288	3696

*Failures; †Junked; ¶Million cu. ft. gas.

Leasing Activity

WEST TEXAS COUNTIES NEAR NEW MEXICO LINE FAVORED

WEEKLY STAFF REPORT

Midland, Texas.—An intensive lease buying program is being waged by majors and independents along the north front of the Permian Basin section of West Texas, particularly in counties adjacent to the east border of New Mexico. Trading is predicated on the theory that the so-called "dolomite platform" will be found productive at intervals on parallel lime highs along a north trend from Andrews County.

Bulk of the lease and royalty buying is taking place in Gaines, Yoakum, Cochran and Terry Counties. The former two counties offer excellent prospects for production, while Cochran County is receiving a test in an area that has afforded a limited amount of oil from previously drilled wildcats, antedating the now perfected method of stimulating production from lime formation with acid. Terry County has just lately come in for considerable attention of the lease buyers, with one wildcat, as previously announced, scheduled to be started at an early date.

The Cochran County wildcat of Humble Oil & Refining Company on the Slaughter ranch, League 135, Armstrong County School Land Survey, was logging hard lime at 4500 feet late last week, using cable tools. Top of brown lime has been tentatively called at 3955 feet or 112 feet sub-sea, and production is due near the 4800-foot level. Honolulu Oil Corporation and C. J. Davidson's Bennett 1, an intermediate test between the above project and nearest production in the Means field, Andrews County, is standing with 4000 feet of oil in cased hole while awaiting court action on title clouds. This promising wildcat producer penetrated several feet of the lime pay in drilling to 5090 feet late in September, and has not been deepened, according to reports.

Standard tools were installed the past week on W. T. Walsh and Harry Adams Corporation's Averitt 1, situated upon the Seminole structure, Gaines County, after using rotary to 3090 feet. It is testing a pronounced geophysical lime high that induced several majors to pay $100 per acre cash bonuses for small leases in and near Seminole early this year, and is credited with having topped the Yates sand, a reliable geological marker, at 3060 feet, with an elevation of 3322 feet. Appearance of high pressure gas production in anhydrite and sand at 2785-95 feet has been accepted as a favorable omen. It necessitated the cementing of pipe at 2812 feet.

Winkler County semi-wildcat test of the Wilgo Oil Company, Southern and Thurman on the Seth Campbell 40-acre lease, SWc SE SW Section 18 Block B-3, P. S. L. Survey, about one mile east of gas wells yielding small amount of oil, was awaiting removal of bridge formed after 370-quart nitro shot in sandy-lime at 3100-3295 feet. The hole was drilled to 3304 feet, or 405 feet sub-sea. Bridge formed after the well made a 20-minute head in responding to the shot. Sun Oil Company's J. B. Walton 1, NEc S½ Section 8, Block B-3, P. S. L. Survey, situated 1½ miles west of production in the Keystone area, filled 3100 feet with fluid, mostly 36.3 gravity oil, with wash water and a small amount of sulphur water, after drilling out cement plugs from seven-inch pipe. Production is from sandy-lime section at 3292-3454 feet, which correlates with the upper gas zone on the Keystone structure. Plans are to shoot the oil formation after the reported sulphur water is exhausted, or the source located.

Initial flow of 243 barrels was recorded by Magnolia Petroleum Company's John Sealy 1, NWc S½ SW¼ Section 94, Block "A", Winkler County, after a shot of 120 quarts of nitro in sandy-lime at 3090-3130 feet. This producer is on the northeast edge of the O'Brien-Hutchings field, which lies mostly in Ward County, and the forerunner of a number of tests to be drilled by the above company on fee land of the Sealy Estate. Sealy 1 was drilled to 3138 feet, or 460 feet below sea level, and tested 55½ barrels oil and 2,500,000 feet of gas during 24-hour gauge preceding the shot. Magnolia Petroleum Company has skidded rig to drill Sealy 2 in the southwest corner of the 80-acre site.

Contract has been assumed by Tom Sloan, Lewis and Bruce McKague for the starting of a 7000-foot test prior to February 1, 1936, on a block of about 5800 acres out of the Sealy ranch and centering about three miles northeast of the above producer. These independents are credited with having paid a cash bonus of $2 per acre for their block. Tentative location has been made at center of SE¼ Section 72, Block "A", G. & M. M. B. & A. Survey.

Four wildcats were listed as failures the past week, including Magnolia Petroleum Company's W. M. Scott 1, SWc Section 186, Block 3, H&GN Ry. Survey, Scurry County, which was carrying hole full of sulphur water from big lime horizon when drilling was halted at 4140 feet. In Garza County, Dobbs Oil Company's W. E. Connell 1, SWc NW¼ Section 75, Block 5, GH&H Ry. Survey, was also showing sulphur water when abandoned in lime at 2870 feet. Kenneth Slack, L. M. White et al's F. Reeves 1, C SE NW Section 20, Block 56, P. S. L. Survey, western Reeves County, failed to yield commercial production after a nitro shot in Deleware lime, which was credited with showing oil saturation, and was abandoned at 3206 feet. Additional exploration work is likely to be attempted in this area. In Jones County, Tip DeArman, Tyler, and associates' J. H. Huffaker 1, SWc 81-acre lease, Section 25, D. & D. Survey, was abandoned in water sand at 2178-81 feet, with an elevation of 1560 feet.

Location has been made by J. G. Harris, McCamey, and associates for a 2000-foot wildcat test to be located in

WEST TEXAS
Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
ECTOR COUNTY (North Cowden Field)—		
Conoco, TP Land Trust 3-A	1298	4270
Empire G&F Co., Wight 2	1200	4275
Mid-Continent Pet. Corp., B. H. Blakeney 1	550	4223
ECTOR COUNTY (Judkins Field)—		
Shell, W. E. Connell 1-B	488	3677
GARZA COUNTY—		
Dobbs Oil Co., W. E. Connell 1	*	2870
HOWARD COUNTY—		
Shasta Oil Co., Dodge 4	967	2767
Sinclair Prairie, Dodge 23	720	2770
JONES COUNTY—		
Tip DeArman et al, J. F. Huffaker 1	*	2181
MITCHELL COUNTY (Iatan Field)—		
Magnolia, Mary Foster 8	40	2840
REEVES COUNTY—		
K. Slack & L. M. White, F. Reeves 1	*	3206
SCURRY COUNTY—		
Magnolia, W. M. Scott 1	*	4140
WARD COUNTY—		
Lindsay Drlg. Co. & Bolin, C. Wallis 2	261	2725
Simms Oil Co., C. D. Mason 2	364	2570
Jerry Sines et al, S. F. Hayzlett 1	28	3049
UPTON COUNTY—		
TP Coal & Oil Co.-Simms Oil Co., Lane 6-D	125	2400
TP & The Texas Co., Pane 6-E	415	2312
WINKLER COUNTY (O'Brien-Hutchings Field)—		
Magnolia, John Sealy Est. 1	243	3138

*Failures; †Junked; ¶Million cu. ft. gas.

TEXAS PANHANDLE
Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
CARSON COUNTY—		
Phillips Pet. Co., E. Cooper 3	300	3040
GRAY COUNTY—		
Gulf, R. B. Thompson 11	278	3280
L. R. Hagy, Harrington & Marsh, L. W. Chadwick 1	¶8-20	3325
W. C. Jones et al, A. J. Culler-Shell 3	960	3320
Kewanee O&G Co., R. E. Smith-Rest 17	220	3250
Magnolia, R. Harrah 8	314	3225
HUTCHINSON COUNTY—		
Owl Oil Corp., J. W. Moore 1	523	3061
Phillips Pet. Co., Johnson-Fromma 1	¶23	2735
Johnson-Garner 2	40	3110
J. W. Moore-Timms 2	231	3045
Stanolind, H. C. Pitcher 5-A	232	3105
E. E. Watkins 5	307	2990
Texas Plains Oil Co., Watkins 3	288	3004
WHEELER COUNTY—		
DuMar O&G Co., C. A. Linkey 2	*	1437
Fain-McGaha Oil Corp., Binkley-Caine 4	505	2435
Helena O&G Co., P. M. Keller 19	2276	2521
The Texas Co., W. B. Bush 6	¶22-853	2528
Keller 14	¶12-2833	2529

*Failures; †Junked; ¶Million cu. ft. gas.

western Crockett County and northeast of the Yates field. Their block consists of about 2300 acres, and location is to be on the O. W. Parker tract, 438 feet from south and 7200 feet from east lines of Section 83, Block 1, I&GN Ry. Survey.

BRYSON EXTENSION

Wildcat gets showings in sandy lime oil zone

Wichita Falls, Texas.—Semi-wildcat well of A. T. Strong et al on the J. L. Cox tract, near west line of T. E. & L. Company Survey 2727, eastern Young County, is preparing to set 6⅝-inch pipe to test promising oil and gas showings developed from sandy-lime zone at 4676-4686 feet. The area forms a west extension to the Bryson field, Jack County, and in the past has afforded small producers from the Strawn series at 2800 feet and the 3200-3300-foot level. Strong et al's deep test is in the same horizon that netted Petroleum Producers Company and The Texas Company's Shanafelt 1, located on the northwest edge of Bryson townsite, a 3000 barrel producer in July, 1929, but the flush yield was of short duration.

NORTH TEXAS

Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
ARCHER COUNTY—		
L. T. Burns et al, B. H. York 5-A..	65	1408
Deep Oil Dev. Co.-Lindsay Drl. Co., Wilson 6, Lse 4-A	1500	2214
W. B. Hamilton Pet. Co., A. J. Ikard 11	75	1148
S. H. Huggins et al, J. J. Perkins 1.	*	1850
Hattie B. Madden et al, J. A. Young 1	*	1465
E. S. McLaughlin et al, Mrs. B. Garrett 1-A	*	747
Perkins-Cullum Oil Co., Falls 203..	100	1133
Falls 204	*	1269
Pet. Prod. Co., J. T. Richardson 6-D	100	1259
BAYLOR COUNTY—		
Consolidated Oil Co., Portwood 12-R, sec 1579	770	1365
Ray & Staniforth, Portwood 28-C, sec 1574	1320	1362
COOKE COUNTY—		
Hudspeth-Harvey-Bass, Truebenbach 4	175	894
Trubenbach 1-B	10	1018
Keil & Keil, Joe Tischler 1	*	1257
O. M. Pierce et al, Truebenbach 2..	140	905
JACK COUNTY—		
B. B. Bryson et al, Richardson-Lanier 1	*	2037
Buttram Pet. Co., J. E. Jones 14...	30	2092
Allard Smith & J. E. Gaines, R. L. Burt 1	*	396
THROCKMORTON COUNTY—		
R. L. Champion et al, Frank Carter 1	*	332
L. G. Hawkins et al, R. E. Erwin 1	*	1500
WICHITA COUNTY—		
Poor Boy Oil Co., F. P. Warren 1	7	569
Rathke Oil Co., Burnett 6	*	1658
The Texas Co., Waggoner Est. 417	*	1132
YOUNG COUNTY—		
L. T. Burns et al, G. H. Roach 1..	*	1340
Fresno Oil Co., J. M. Kirkland 10.	*	720
Harry Hines et al, Stella Powell 1..	*	1404
Chas. E. Knox et al, E. Taylor 2-B	175	2733
Ben F. Looney et al, C. C. Robinson 1, sec 1649	*	450
Carrie E. Peterman et al, J. R. Dyer 6	*	600
Underwood Drl. Co., Campbell 6-C, sec 3401	200	899
D. L. Wolf et al, M. E. McBrayer 1, sec 1907	*	683

*Failures; †Junked; ¶Million cu. ft. gas.

Cayuga Discovery

WELL COMPLETED IN TRINITY FLOWS GAS AND DISTILLATE

WEEKLY STAFF REPORT

Fort Worth, Texas. — Production tests given Tide Water Oil Company and Texas Seaboard Oil Company's Wills 21-A, discovery well of the Trinity horizon in the Cayuga field, indicates a daily yield of from five to seven million cubic feet of gas along with an hourly flow of three barrels of distillate and two barrels of wash water.

Distillate accompanying the gas production from the Cayuga deep test is water white in color, and tests about 56 gravity (corrected). No appreciable increase has been noted in the volume of gas and distillate production after the removal of the bulk of the rotary drilling fluid from the hole. A brackish taste, indicating probable presence of salt water in the producing horizon, was credited to the water drained from the separator and tanks earlier in the week, but representatives of the partnership discount the report. No samples of the distillate were permitted representatives of other companies that visited the well the past week.

Cayuga field's first deep well is producing from the Glen Rose member of the upper section of the Trinity sand series, with a thick section of anhydrite overlying the gas zone. It is somewhat similar to the oil producing horizon currently holding the Rodessa field, Louisiana, in the spotlight. However, the structural conditions differ widely.

Formations penetrated below the Glen Rose by the Gayuga well did not carry oil or gas with the hot salt water encountered at intervals in drilling to 9082 feet, or the lower section of the Trinity. The hole was plugged back by stages and tested by perforating the seven-inch pipe, which was cemented at 8750 feet. Production is coming from 100 gun shot perforations made between 7210 and 7360 feet, with the cement plug set at 7395 feet. Top of Georgetown lime was logged at about 4650 feet, with an elevation of 308 feet.

EAST TEXAS

Completions

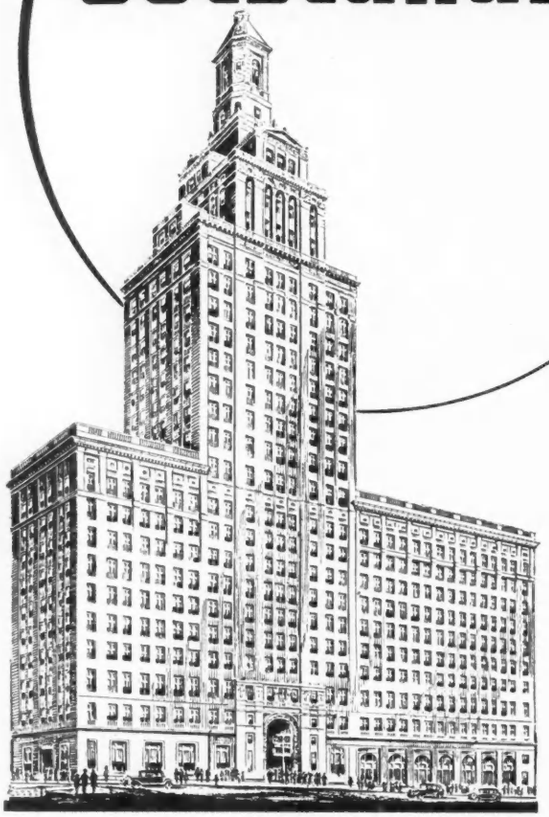
Company, Well and Location	Init. Prod. Bbls.	Depth
JOINER AREA—		
Arcadia Ref. Co., J. B. Gilstrap 1 (5-ac)	160	3595
Chester Oil Co. (Sam Flanz), J. N. Hale 2 (20-ac)	100	3618
Elm Oil Co., G. M. McElroy 3 (10.17-ac)	5800	3791
Genro Drl. Co. (J. F. Liston), C. H. Gilstrap 1 (3-1/7-ac)	225	3590
(T. E. Castle), B. Gipson 1 (5-ac)	240	3812
H. H. Howell & Hawkins, Propes 2 (26½-ac)	240	3575
Humble, J. E. Sexton 8-A (68.8-ac)	7600	3728
Hunt Prod. Co., R. W. Fair 25-C (211.4-ac)	10,500	3622
R. W. Fair 27-C (211.4-ac)	10,000	3629
Luling O&G Co., Alford 2 (10-ac)..	500	3694
Alex McCutchin et al, H. Clay 4 (17-ac)	1000	3670
Marathon, M. M. Cross 79 (814.84-ac)	7000	3639
Milford Oil Co., A. P. Finney 8 (40-ac)	5500	3690
Sentinal Oil Corp., Frederick 2-E (3½-ac)	100	3640
Jas. T. Smith, Inc., Frederick 3 (10.19-ac)	100	3700
Frederick 4 (10.19-ac)	120	3703
Stanolind-Pure, R. M. Moores 29 (251.46-ac)	5000	3691
Sun, Alfred Lee 12 (147-ac)	5600	3619
J. B. Sneed et al, G. Gossett 3 (16.63-ac)	4000	3675
KILGORE AREA—		
B. F. Carroll et al, Mrs. J. Laird 1.	1120	3600
Gulf, G. W. Culver 25 (209-ac)	6500	3575
Hurtle Oil Co., Wm. Sexton 1 (100ac)	240	3680
C. V. Lansberry, Rec., A. Money 6 (320-ac)	500	3657
La. Oil Ref. Corp., W. C. Griffin 11, (71.77-ac)	9500	3578
Magnolia, H. P. Hale 8 (50-ac)	120	3550
Martin & Sladek Pet. Corp., Russell 3 (17½-ac)	9500	3732
Saltmount Oil Corp., (L. A. Demmer), Kennedy 1 (20-ac)	100	3742
J. R. Sharp et al, Morton-Dickson 2	50	3598
Sinclair Prairie, King 54-A (290-ac)	9000	3526
Sun-Texas Seaboard, J. N. Campbell 14 (106.9-ac)	8500	3532
LONGVIEW AREA—		
Arkansas F.O. Co., J. W. Harrison 6-B (29.91-ac)	9400	3570
Atlantic-Sun, M. Hays 63 (448-ac)	11,000	3554
M. Hays 66 (448-ac)	10,500	3560
Atlantic-Stanolind, Fishburn 16 (112.45-ac)	10,000	3523
Collins-Gray & Wolf, Fisher 10 (134.67-ac)	3000	3435
Erle P. Halliburton, Inc., J. F. Phillips 9 (94-ac)	4000	3719
Thos. D. Humphrey, L. M. Baker 1-B (23-ac)	435	3606
Joe Long Drilling Co., W. W. Owens 10-A (208-ac)	6000	3632
Shell, J. Moore 30 (303.7-ac)	7500	3563
Sinclair Prairie, W. H. York 10 (86.45-ac)	9200	3594
Stanolind, V. Calvin 12 (62.02-ac)..	6500	3633
Thibodeaux Oil Co., A. J. Sanders 9 (45-ac)	8500	3679
VAN ZANDT COUNTY (Van Field)—		
J. Bren et al, J. S. Palmer 2	†	1324
Pure Oil Co., W. E. Morris 1 (10½-ac)	33	2934
CAMP COUNTY—		
E. R. Smith et al, J. M. Jordan 1..	*	4350
CASS COUNTY—		
Stanley A. Thompson et al, Coy Dunbar 1	*	4275
HOUSTON COUNTY—		
A. H. Smith et al, Smith Bros. 1..	*	1801

*Failures; †Junked; ¶Million cu. ft. gas.

Tyler, Texas. — Volume of completions in the East Texas field dropped to a low level the past week, with a corresponding gain in percentage of non-flowing wells noted on the short list of producers.

There were only 42 wells added during the week, as compared to a total of 66 the week previous.

Outstanding



DEPOSIT INCREASE

From April 25, 1933
to November 1, 1935

99.419%

On April 25, 1933 our deposits were $22,327,010.62.

On November 1, 1935 our deposits were $44,524,493.43.

An increase of $22,197,482.81.

NATIONAL BANK OF TULSA

TULSA, OKLAHOMA

The Oil Bank of America

Hidalgo Field Looms

AREA EAST OF SAMFORDYCE IN SPOTLIGHT AS WILDCAT SHOWS

SOUTH TEXAS

WEEKLY STAFF REPORT

San Antonio.—S. J. Sloan et al's Brock and Showers 1, just west of Mission in Hidalgo County, showed oil while being swabbed through perforations at 4648-60 feet, and preparations are being made to re-run tubing and complete. The well made one head of oil while tests were underway. It is 6003 feet deep and casing is set at 4715 feet, the intention being to test several possible producing horizons indicated on electric formation test. The wildcat is located in the southwest corner of Lot 9, Block 16, Porcion 80, and is several miles east of the Samfordyce field.

Samfordyce field received two extensions during the week, one being on the west side in Starr County and the other on the east side in Hidalgo County. Mundy and Stevens' F. B. Guerra 1, 2000 feet north of the east end of the field plugged back from 3030 feet to 2920 feet, perforated casing at 2760-68 feet, after getting sand at 2753-68 feet. The well came in quickly and showed a large volume of gas and no oil. It extends the gas area, and suggests that more development will result in that sector. Barnsdall Oil Company and Phillips Petroleum Corporation's Yturria Land and Cattle Company 3, 534 feet north of the same company's second producer, cored saturated sand at 2803-11 feet, set casing on bottom and will gun-perforate for completion. It is the most northwesterly producer for the field.

Nueces County Test

A hot wildcat in Nueces County is holding interest of the southwestern portion of the Gulf Coast. It is Santa Clara Oil Company's Clara Driscoll Sevier 1, William Gamble Survey, 1¾ miles northeast of the town of Driscoll. The well cored a sand cap at 3705-09 feet, sand 3709-23 feet, and sand, shale and sandy shale streaks to 3750 feet. A drill stem test was attempted between 3904-24 feet but the tool slipped to 3913 feet while the test was being made, the result being 500 feet of mud, 400 feet of oil and mud and a little free oil, but no pressure. Another sand, showing oil, was cored at 4804-12 feet and drill stem test was being made late in the week.

A 12-minute drill stem test through ¼-inch and 5/8-inch chokes in 12 minutes from 4804-12 feet developed 2130 feet of pipe line oil, and preparations were being made to set casing late in the week. The well is considered to be the opener of a new field.

J. K. Culton has made a location for the second well in the new field just west of Corpus Christi, Nueces County. It is Russell Savage 1, in a 7.1-acre tract in the Villareal Survey, west offset to the discovery well.

Magnolia Petroleum Company recorded a failure in the regular sands of the Baldwin field in Bobby Baldwin 4. The well showed 90 feet of sulphur water on drill stem test at 4072-74 feet and is drilling ahead. Gilcrease Oil Company's W. W. Sanders 2 has been completed for an initial flow of 30 barrels per hour through quarter-inch choke from sand at 4049-58 feet and Sanders 3 is rigging up. Magnolia Petroleum Company's Sanders 2 is drilling below 2750 feet.

T. P. Morgan et al's J. F. Welder Heirs 1, nw se Section 591, one mile south of the Seven Sisters field, Duval County, cored salt water sand at 2572-77 feet. The well apparently defines the field in that direction.

The above failure is the first test to reach the sand since an interesting lease and wildcatting play started in the general Government Wells district several weeks ago.

The Seven Sisters, Loma Novia, and Sarnosa fields provided 12 new producers during the week, showing a combined initial flow exceeding 7000 barrels per day. Their depth range from 2400 to 2800 feet.

Over in Webb County, Rhea Nixon and R. W. Talbot's A. S. Billings 1 was in final stages of completion late in the week from sand at 2170-77 feet. The well is located one mile southwest of the Lopez field.

PLACEDO ACTIVE

More locations staked as new producers completed

San Antonio.—Placedo field, Victoria County, has shown an increase in activity following the establishment of a more stable producing area just below 4700 feet.

With the extension of the field southwest to include the territory immediately surrounding the Placedo Junction townsite, a rather heavy campaign is in prospect. The acreage and leaseships are rather well broken in this sector of the field.

As the week closed there were 16 wells drilling or actual locations made, being divided among the Barnsdall Oil Company, Felmont Oil Corporation, Costa Oil Company, Eastern Texas Petroleum Company, Westgate Oil Company, J. McDowell, Sun Oil Company, E. L. Smith Oil Company and American Liberty Oil Company.

Barnsdall and Felmont's J. M. Pickering 2 flowed 147 barrels in 24 hours through 8/64-inch choke from 4780 feet. J. McDowell's Kirasek 1, in block 45 of the Placedo townsite, is showing a fair volume of oil, but will not flow and tubing and rods are being run to put on pump. The well is at a total depth of 4771 feet, casing set at 4758 feet. Westgate Oil Company's Henderson & Pickering 1, also in the Placedo townsite, is rigging up to recomplete at 4755-78 feet. It ran wild, burned and destroyed derrick and rig.

One well was being drilled to the deep sand, that being the Costa Oil Company and Eastern Texas Oil Company's Schovajsa 1-A, which is down 5860 feet in shale and lime.

In the Coleto Creek field, same county, Clifford Camp's R. Kanster 1 is rocking with gas at a total depth of 2842 feet, casing set 2836 feet.

Edwin M. Jones had reached 6315 feet and was drilling ahead on J. M. O'Brien 11-A in the Greta field, Refugio County. It is one of the deepest wells to be drilled in the field and located on the structure. As a result, it will be watched with considerable interest.

Southeast of the above well in the Tom O'Connor area, also in Refugio County, Quintana Petroleum Corporation is drilling Tom O'Connor 24-A and 25-A and has derricks up for the next two wells.

Continuing farther southwest along the trend, Plymouth field, San Patricio County, has 12 rigs running. Conroe Drilling Company is drilling at 4750 feet in E. H. Welder 2-D and is ready to drill below 436 feet of surface casing in E. H. Welder 3-D. Heep Oil Corporation's E. H. Welder 12-E is waiting on rig, while E. H. Welder 4-F is recompleting at 5651 feet, with seven-inch casing set on bottom.

Magnolia Petroleum Company's Corpus Christi Bank & Trust Company 3, south end of the field, is being completed as the second producer for the field in the 5900-foot sand. The well has sand at 5891-5900 feet with casing set atop the sand. It showed 1080 feet of pipe line oil, 75 pounds pressure and no water through quarter- and five eighths-inch chokes, bottom and top, in 11 minutes.

Plymouth Oil Company's E. H. Welder 19-C is drilling plugs on sand at 5605-18 feet. Welder 20-C is drilling below 5400 feet. Welder 21-C is drilling below 4000 feet. Welder 22-C is drilling below 330 feet or surface casing. Welder 23-C is moving in rig.

Sun Oil Company's active well, J. M. Hunt 1, is drilling below 5000 feet. George E. Smith's Britton 1, southeast of the field, has set surface casing and is ready to drill ahead. Benedum & Trees' Welder 1, west of the field, is drilling at 6371 feet.

T. P. Coal and Oil Company and Venza Oil Company's J. M. Rosborough 1, Morris and Cummings Survey 33, one half-mile south of the discovery in the Mauritz field, Jackson County, is coring for the 5600-foot sand.

Shell Petroleum Corporation's Mauritz Brothers 1-A, Kountze Survey, one half-mile northwest of the producer, is coring at 6140 feet, failing to find the sand. Smith and McDonald's Mauritz Brothers 1, Morris and Cummings Survey No. 17, one half-mile northeast of the producer, has been abandoned

at 6714 feet, also failing to find the sand.

Several excellent completions were reported in the pettus district, including Bee, Karnes, Goliad and Live Oak Counties, during the week.

Brown and Wheeler's Jennie Ray Kauffman 1, discovery well of Conroe production in Hords Creek field, Goliad County, was deepened from 4538 feet, depth of its original completion to 4581 feet. It then was plugged to 4566 feet, where it is cleaning. It is flowing about six barrels of oil per hour through one eighth-inch choke.

The Texas Company's S. E. Young 11 gauged 35.8 barrels in two hours through quarter-inch choke. The well is in the Dirks field of Bee County.

SOUTH TEXAS Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
BASTROP COUNTY—		
Port Isabel O&G Co., G. A. Smith 1, 600 ft due se of e cor J. Doyle sur, but in J. B. Blalock sur.....	*	1674
BEE COUNTY—		
Clyde Echols, J. T. Hudman 1, 150 ft nw cor 10-ac tr, Baker sur (Caesar)	720	3088
Texas, S. E. Young 11, Geo. Young sur (Dirks)	475	3911
BEXAR COUNTY—		
F. H. Eckert, L. Brehm 14, P. L. Boquar (Eckert)	8	681
BROOKS COUNTY—		
United Prod. Co., K. J. Hocker 1, 8481 ft el, 1636 ft nl tr, Palo Blanco de Maguellos gr (Palo Blanco)	*	5351
CALDWELL COUNTY—		
Clark & Crouch, Jolly, C. Crenshaw sur (Larreomore)	20	1296
CALHOUN COUNTY—		
Halliburton Oil Prod. Co., D. Burton 4, M. Sanches sur (Port Lavaca) pb 6243 ft	200	7460
DUVAL COUNTY—		
Buchanan & Blanco, Welder 2, sec 385 (Seven Sisters)	840	2476
Rodney Delange, Hahl 3, lot 6, sec 78 (Loma Novia)	725	2672
Dulce Oil Co., R. Serna 4, sec 384 (Seven Sisters)	850	2499
Humble, Welder 4-C, sec 554 (Seven Sisters)	360	2701
Magnolia, Duval-Sentz 1, 330 ft sl and el, sec 155	*	3822
Hahl 10, sec 67 (Loma Novia)...	600	2604
Magnolia-Hahl 2-C, blk 9, sec 78 (Loma Novia)	250	2528
Mid-Continent, R. Serna 2, sec 384 (Seven Sisters)	600	2491
Reynosa Oil Co., M. Davidson 2-B, sec 114 (Loma Novia)	850	2593
Seaport Oil Co., Duval Ranch 16-A, sec 574 (Sarnosa)	35	2411
Texla Oil Co., Nueces Land and Cattle Co. 1, 330 ft sl and wl ne¼ sec 101	*	2753
GOLIAD COUNTY—		
Brown & Wheeler, J. R. Kauffman 1, P. Trevino sur (Hords Creek), old well former td 4538 ft, dr ahead and pb 4566 ft	450	4581
HIDALGO COUNTY—		
Cortez Oil Co., F. B. Guerra 2, tr 12, por 41 (Samfordyce)	500	2764
Mundy & Stevens, F. B. Guerra 1, tr 12, por 41 (Samfordyce), 2000 ft n prod, pb and perf csg 2760-68	¶20	3030
Showers & Moncrief, F. B. Guerra 2, tr 254, por 39 (Samfordyce) 1650		2801
JACKSON COUNTY—		
Smith & McDonald, Mauritz Bros. 1, 466 ft wl, 394 ft sl 80-ac lease, Cummings sur No. 17 (Mauritz)..	*	6714
KARNES COUNTY—		
Magnolia, Guy Porter 10 (North Pettus)	100	3680
LIVE OAK COUNTY—		
Lion Oil Refining Co., Dick Dobie 1, GH&H sur No. 23 (McNeill)	*	6212
McMULLEN COUNTY—		
Loma Oil Co., L. Jacob Corp. 41-A, W. H. Jacob sur No. 9 (Jacob)..	*	940
Stephenson & Wuest, Fisher 1, 330 ft bwl sur and 800 ft sw of Worley 1, R. O. O'Boyle sur	¶6	502
MEDINA COUNTY—		
Gates & Hill, Odom 3, H. Castro sur No. 147	*	465
NUECES COUNTY—		
Gilcrease Oil Co., W. W. Sanders 2, sec 165 (Baldwin)	750	4058
REFUGIO COUNTY—		
Quintana Pet. Co., Tom O'Connor 22-A, Swisher sur No. 5 (Tomoconnor) 1500		5920
Tom O'Connor 23-A, Swisher sur No. 3 (Tomoconnor) 1650		5891
STARR COUNTY—		
H. J. Porter et al, Garcia Land & Cattle Co. 1-B, por 100 (Samfordyce) (second hole)	†	2412
TRAVIS COUNTY—		
Burns & Schramm, C. C. Nelle 1..	†	735
VICTORIA COUNTY—		
Barnsdall & Felmont, J. M. Pickering 2, Bronson sur (Placedo).....	350	4780
WEBB COUNTY—		
O. W. Killam, A. M. Bruni 42, blk 30, sec 15, Arispe gr (Cole).....	*	3023
WILLIAMSON COUNTY—		
McGee et al, Pfluger 1, White sur (Byersville)	*	1005
Rule et al, Backmeyer 1, Cartwright sur	*	1003
ZAPATA COUNTY—		
Texas, Whitehead 78, Cerrito Blanco gr Escobas)	35	1230

*Failures; †Junked; ¶Million cu. ft. gas.

Correction

In the November 11 issue of THE OIL WEEKLY there appeared a statement saying the C. H. Lewis well, Lopez field, Webb County, was reported making a slight bit of water. A telegram received November 14 from J. H. Brower, part owner and superintendent, says the report was not true.

IXL
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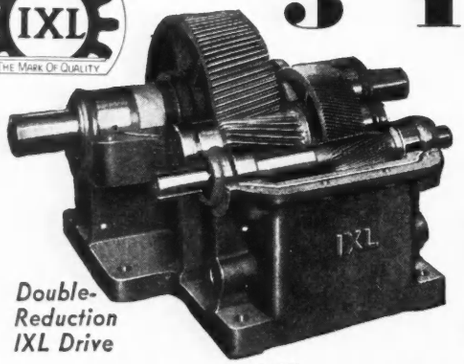
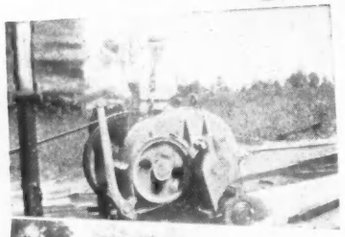
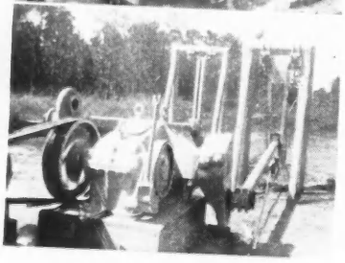


Double-Reduction IXL Drive





IXL Helical Pump Drives provide the element of dependability you need in this vital link in your pumping equipment. Three years of daily service in the oil fields proves the merits of these units. Not a single failure of any kind has marred the IXL record in all this time.

New units are daily adding evidence of the stamina of IXL heat-treated helical gears, large oversize ball and roller bearings, and the extra heavy base and heavily ribbed semi-steel case. The entire drive is built in accordance with A. G. M. A. recommended practice. It "stands the gaff" in tough oil field service. It is backed by more than 75 years of gear design and application experience.

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Salt Dome Proven

DRILLING WELL AT SOUTH HOUSTON HITS ROCK SALT

WEEKLY STAFF REPORT

Houston.—The South Houston oil field, Harris County, was definitely proven as a salt dome last week when Stanolind Oil & Gas Company's Drilling District 10, Well No. 1, topped rock salt at 4662 feet.

A 20-foot core was taken from 4662 to 4682 feet containing rock salt. The operators were still in salt at 4734 feet.

Diadem Oil Company's Dean 1, 900 feet west of Drilling District 5, Well No. 1, Mary A. Nichols Survey, was completed late November 15 from 4734 feet, flowing at the rate of 500 barrels per day through a ⅜-inch choke. This well is said to be one of the best wells in the field, and it makes the first independent operator to enter the South Houston field. Dean 1 will force several offset wells.

Stanolind Oil & Gas Company's Drilling District 5, Well No. 1, extended the field 1950 feet west, when it came in for 27 barrels the first hour and half from 3862 feet. Top of the oil sand was found at 3845 feet, and 7⅝-inch casing was set at 3846 feet. The well came in through a quarter-inch choke with 225 pounds pressure on the tubing and casing. The test is located 1950 feet west of the discovery well in the center of lot 2, block 7, H. & T. B. Survey, No. 5. It is 1050 feet southwest of Drilling District 10, Well No. 1, which topped the rock salt, also bing 900 feet east of Diadem Oil Company's Dean 1.

The South Houston field was defined to the north when Stanolind Oil & Gas Company abandoned its Meadow Brook Development Company 1 at 6171 feet, after testing salt water sand. The well had sandy shale at 5754 feet, and from 5151 to 5176 feet the operators had a showing of oil and salt water.

Hastings Field

The Hastings field, Brazoria County, was extended 660 feet south during the past week, when Stanolind Oil & Gas Company completed its Hutcheson 1, H. & T. B. Survey, No. 36, for 166 barrels in nine hours from 6080 feet. The oil sand was topped at 5934 feet, and seven inch casing was set at that depth. The operators used a quarter-inch choke to bring the well in. Tubing pressure was 875 pounds; casing pressure 825 pounds. The test topped the Discorbis at 5100 feet, Heterostegina at 5460 feet, and the Marginulina at 5533 feet. This test is running lower than Hutcheson 1 and other wells drilled on the west flank of the field, indicating a dip in this direction, and it is reported that the field will not go much further southwest.

Old Ocean Field

Harrison & Abercrombie's Bernard River Land Company 2, C. Breen Survey, Old Ocean field, Brazoria County, was completed during the past week, being the second well completed in the field, which extends the producing limits 1000 feet in the northerly direction.

The well came in making 500 barrels per day from 8657 feet. The 67.8 gravity oil was flowing through a 15/16-inch choke with 1500 pounds pressure on the tubing and 1540 pounds on the casing. The well is reported making a small amount of salt water.

The well is producing from the Frio formation from sands 8643 to 8657 feet. The Frio formation was found at 8450 feet.

Harrison & Abercrombie have had considerable trouble with this well. It was spudded in May, 1935, and was completed around November 11, 1935. The hole was drilled down to 8651 feet, and the oil sand was found at 8476 feet, and while reaming down the hole side tracked at 5528 feet. At 7040 feet a fishing job was encountered, and operators were forced to plug back to 3400 feet. Several plug-back jobs were encountered on this well, causing the delay in drilling.

The Pledger gas field, Brazoria County, was extended 2500 feet east during the past week, when Humble Oil & Refining Company's Smith 3, came in for 3,500,000 cubic feet of gas daily from 6750 feet. A quarter-inch choke was used and the tubing pressure was 2300 pounds; casing pressure 900 pounds. The well is located 2500 feet east of Smith 1, in the D. McNeel Survey.

In the Wild Peach Subdivision of Brazoria County a brisk leasing campaign has been in progress for some time. One of the major oil companies is reported to be taking acreage in this area.

Texas Gulf Producing Company's K. B. Winston 1, in the Harlem-Coldine area, S. Isaacs Survey, Ft. Bend County, had an odor of oil in the Upper Saline Bayou during the past week from 7663 to 7675 feet. The Upper Saline Bayou was found at 7476 feet.

As compared to Phillips Petroleum Company's A. E. Holmes 1, north of Winston 1, same survey, the latter well is running about normal and a little lower than the former well structurally.

E. E. Young's Griffith 1, west of the Humble field, A. R. Bodeman Survey, Abstract A-140, Harris County, was shut down depending on testing a sand from 3350 to 3360 feet and from 3740 to 3750 feet, at the end of the week. The operators ran an electrical logging device and it showed possible oil sands at the above depths.

Van Vleck Field

Skelly Oil Company has completed two wells in the Van Vleck field, Matagorda County, from two different sands. Cobb B-1, the discovery well, which was completed some time ago around 7000 feet, M. Cummings Survey, was drilled on down to 7468 feet and completed. Cobb B-3, 2235 feet northeast of the discovery well, was completed at 8228 feet.

Skelly Oil Company's Cobb B-1 was perforated between 7465 and 7468 feet and the well made 153 barrels daily on various size chokes. The well has a high gas/oil ratio. Cobb B-3 was completed from perforations in the casing from 8225 to 8228 feet. It made 395 barrels per day through a 3/16-inch choke. Tubing pressure was 1150 pounds; casing pressure 1100 pounds. The well is making 275,000 cubic feet of gas, or a gas/oil ratio of 7000 to 1. Both wells are making 35.5 gravity oil and no salt water. Neither well has any screen set in the holes.

Continental Oil Company's Feife 1, Citrus Grove prospect, J. S. Chriswell Survey, Matagorda County, was shut down repairing boilers after sticking the drill pipe at 7485 feet.

The operators were drilling with a spe-

TEXAS GULF COAST

Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
ANAHUAC—		
Gulf, Knowles 1	*	8749
Humble, White 3	633	7085
BIG CREEK—		
Tran State Oil Co., Blakely 1-B	700	4050
BLUE RIDGE—		
San Jacinto Oil Co., Blakely 8	45	4125
BOLING—		
Mack & Hack Oil Co., Farmer 2	150	4659
Texas Co., Taylor A-14	*	3301
DICKINSON—		
Humble, Anderson 1	408	9127
HASTINGS—		
Stanolind, Hutcheson 2	444	6080
LIVINGSTON—		
Humble, Grandbury 18	264	4235
Sun, Pratt 9	130	4251
MARKHAM—		
Hamil & Hamil, Kountz 3	*	5310
OLD OCEAN—		
Harrison & Abercrombie, Bernard River Land Co. 1	500	8657
PICKETT RIDGE—		
Texas Co., Pierce Estate A-4	*	4772
PIERCE JUNCTION—		
Rio Bravo Oil Co., Settegast A-1	490	4210
PLEDGER—		
Humble, Smith 3	¶3½	6750
RACCOON BEND—		
Humble, Hellsmuth 8	295	4097
Wilson 8 (wo)	50	4174
Wilson 15 (wo)	70	3295
SOUTH HOUSTON—		
Stanolind, Drilling District, Well No. 1	578	3862
Meadowbrook Dev. Co. 1	*	6171
THOMPSON—		
Gulf, Booth A-26	1488	5310
VAN VLECK—		
Skelly Oil Co., Cobb 1 (wo)	153	7468
Cobb B-3	395	8228
CHAMBERS COUNTY—		
Salt Dome Oil Co., Lawrence 1, Cotton Lake area, J. Grant sur.	*	7005
JEFFERSON COUNTY—		
Humble, McFaddin 1 (wo), Jefferson Island prospect, T&NO sur, sec 370	*	6097

*Failures; †Junked; ¶Million cu. ft. gas.

cial 8⅝-inch casing, and upon reaching 7485 feet it was stuck in heaving shale. It was cemented at that depth.

The well had sand and shale with streaks of sand having a slight odor of oil from 6800 to 6845 feet in the Marginulina formation.

PICKETT RIDGE

Unproductive test defines new field

Houston.—The first disappointing well in the Pickett Ridge field, Wharton County, is The Texas Company's Pierce Estate A-4, T.&N.O. Survey No. 38. It was abandoned during the past week at 4772 feet. This test also defines the new field in the southeasterly direction.

Pierce Estate A-4 was drilled down to 4718 feet, and a drill stem test was taken from 4705 to 4718 feet. The test showed 1504 feet of salt water, with no pressure. The test was made in 10 minutes through quarter-inch chokes on top and bottom. It was then drilled down to 4772 feet and abandoned. The well topped the Discorbis at 4042 feet and the Heterostegina at 4328 feet.

The well is 2250 feet southeast of the discovery well and 2000 feet from Pierce Estate 3-A, the nearest producer.

This is the fourth well drilled in the area by The Texas Company. Pierce 1 was a dry hole, Pierce A-2 was the discovery well, and Pierce A-3 was a producer. The Texas Company is drilling on Pierce A-5, which is 660 feet south of Pierce A-3, I.&G.N. Survey No. 38.

The Texas Company has made location for Pierce Estate A-4. It is 660 feet north, 58 degrees east, 751 feet south and 32 degrees east from Pierce Estate A-2.

GEOPHYSICISTS MEET

Dallas to entertain men to read technical papers

A winter meeting of the Society of Petroleum Geophysicists, to be held in Dallas on November 29, recently was announced. A general symposium on geophysical activity will follow an afternoon session of technical papers.

L. W. Blau, head of the geophysical department of Humble Oil & Refining Company, Houston, will present a paper on "Black Magic in Geophysical Prospecting." M. M. Slotnick of the same company, will read "Seismic Computations Assuming the Velocity and Integrable Function of Depth, With an Application." W. M. Rust, Jr., also of the Humble Oil & Refining Company, will read "A Review of Electrical Prospecting Methods." Dr. C. G. Morgan, Seismic Service, Incorporated, Tulsa, will give a report on results obtained on the recent Byrd expedition to Antarctica.

Titles have not been announced on other papers to be presented by E. E. Rosaire, Independent Exploration Company; E. G. Leonardson, Schlumberger Electrical Prospecting Company; E. A. Eckhardt, Gulf Refining Company; J. Brian Eby, geologist, all of Houston. Tulsa representatives will be H. M. Evjen, Shell Petroleum Company; Alfred Wolf, W. T. Born, and L. Y. Foust of Geophysical Research Corporation.

Drilling General

PROSPECTING GOES AHEAD IN NUMEROUS DISTRICTS

Houston.—After encountering salt water from 6820 to 6900 feet, Salt Dome & Gem Oil Company's Lawrence 1, Cotton Lake Prospect, J. Grant Survey, Chambers County, was abandoned at 7005 feet November 9.

An electrical logging device was run. It showed salt water sands in the Frio formation. This wildcat created more excitement among the Gulf Coast operators than any other wildcat drilled in the Gulf Coast in some time. A brisk leasing campaign preceded the drilling of Lawrence 1. Several major and independent oil companies invested several thousand dollars in this area.

The well was running about normal for the area after finding the Discorbis at 5883 feet. The Heterostegina was topped at 6185 feet, Marginulina at 6430 feet, and the Frio around 6769 feet.

Lawrence 1 is located 1913 feet south and 42 degrees west from the northwest corner along the southwest line and 330 feet north and 48 degrees east from the southwest line of the Lawrence 344.6 acre tract in the J. Grant Survey.

In the area of Barbers Hill, Chambers County, a semi-major oil company has been working with torsion balance for the past 90 days, and since completing its geophysical work has started leasing acreage in the area.

Anahuac Field Defined

The Anahuac field, Chambers County, was defined in the northeast direction during the past week when Gulf Production Company abandoned its Knowles 1 at 8749 feet, the well being the deepest drilled in the field.

The well is located east and a little north of Humble Oil & Refining Company, R. A. Mason and Glenn H. McCarthy's R. M. White 1, which extended the field three miles in the northerly direction some time ago. It is considered an east offset to the extension test. It is in the H. & T. C. Survey, Section 48.

Humble Oil & Refining Company, R. A. Mason & Glenn H. McCarthy completed R. M. White 3 at the close of the week. The well came in for 633 barrels per day from 7085 feet. The 33.6 gravity oil flowed through a quarter-inch choke, with 1125 pounds pressure on the tubing and 1215 pounds on the casing. The well topped the Discorbis at 5872 feet, Marginulina at 6631 feet and Frio at 6919 feet. The test is located 933 feet west of R. M. White 2 and 466 feet north of the south line of the J. MaGehe Survey.

Humble Oil & Refining Company has made location for eight additional wells in the field.

Battaille et al have made location for a wildcat in Montgomery County. D. H. Caswell 1 is located 2490 feet west and 150 feet north of the southeast corner of the David Davis Survey, being four miles south of the Conroe field and due east of Tamina. It is located near Turnbull & Irwin's dry hole in the C. Allen Survey.

Near the Hardin field, Liberty County, Dick Schwab is preparing to make a location southwest of Jack Frazier's discovery well and southeast of his first dry hole. The test will be drilled into the Lower Saline Bayou and test the sand from which Jack Frazier's Lynott Buffam 1 is producing. Around Humble Oil & Refining Company's large block at Devers a semi-major oil company is reported leasing tracts at $100 per acre.

In Jasper County, David B. McDaniels, the geologist who made the location for R. A. Mason & Glenn H. McCarthy's R. M. White 1, which extended producing limits of the Anahuac field, Chambers County, three miles in the northerly direction, is reported to have taken a block of acreage in this county. The acreage is south of

RANK OF OPERATORS

Humble still leads with Stanolind in third place

Houston.—Stanolind Oil & Gas Company ranks third among the oil producing companies, due to purchase of Yount Lee Oil Company stock and the discovery of Hastings field, Brazoria County.

Tide Water Oil Company, a semi-major company which has been operating in the Texas Gulf Coast for only three years, has developed production to where it now is up in seventh place.

Following is a list of some leading oil producing companies, ranked according to the number of producing wells and daily allowable of each in the Texas Gulf Coast.

Company—	No. Prod. Wells	Daily Average Allowable Barrels
Humble Oil & Refining Co.	871	43,485
The Texas Co.	288	15,500
Stanolind Oil & Gas Co.	225	14,200
Sun Oil Co.	246	9,227
Gulf Production Co.	312	13,857
Texas Gulf Producing Co.	55	5,128
Strake Petroleum Co.	65	2,857
Tide Water Oil Co.	73	3,026
Harrison & Abercrombie	36	2,133
Alpha Petroleum Corp.	38	2,115
Houston Oil Co.	34	2,080
Mills Bennett Prod. Co.	33	2,054
West Production Co.	19	1,734
Sinclair Prairie Oil Co.	53	1,620
Pure Oil Co.	24	1,512
General Crude Oil Co.	51	1,496
John Deering	9	1,291
Superior Oil Producing Co.	14	1,117
Sterling Oil & Refining Co.	20	787
Shell Petroleum Corp.	9	717
Skelly Oil Co.	7	327

Evadale. No geophysical work has been done in this area. Republic Production Company has worked to the east of the acreage with torsion balance, and Gulf Production has drilled a test to 6975 feet which tested salt water around 6670 feet.

In Walker County Bradley et al have made location for Tonty Lumber Company 1. It is 1205 feet north, 45 degrees east, 450 feet north, 45 degrees west from the southeast corner of Harrison 320-acre tract and survey. It is in the New Waverly area and in the J. C. Harrison Survey, Abstract 263.

Humble Oil & Refining Company abandoned its Kyle E. White 1, (McFaddin 1), Jefferson Island prospect, T. & N. O. Survey, Jefferson County at the close of the week at 6097 feet, after sticking the drill pipe in heaving shale. The test was originally abandoned at 3557 feet some time ago, but after doing geological work in the area the operator decided to rework the test and carry it down to deeper sands.

Dickinson Field

Humble Oil & Refining Company completed its fourth well in the deep sand in the Dickinson field, Galveston County, during the past week, when Anderson 1, north offset of Danielson 1, the discovery well for the deep sand, came in at the rate of 17 barrels per hour from 9127 feet. The well was flowing through a quarter-inch choke, showing no water. The test is in the J. Sellers Survey, Harris County.

Humble Oil & Refining Company's Bayou Development Company B-1, 1223 feet northeast of Bayou Development Company 1, J. Sellers Survey, has reached to deep sand, and will probably make a production test the coming week. The well has been drilled to 9125 feet, and the oil sand was topped at 9116 feet. If the well proves a commercial producer, it will extend the Dickinson field over 1000 feet east.

Coast Petroleum Company's Maco Stewart A-2 was coring for the producing sand on the southwest flank of the Dickinson field at 8409 feet at the end of the week. The test is 660 feet due west of Maco Stewart 1, which extended the field over two and half miles some time ago. It is in the W. K. Wilson Survey.

NEW PRODUCERS

Houston.—Completions along the Texas Gulf Coast during the past week showed an increase over that of the previous week. There were 25 completions in the area and of that amount 17 resulted in flowing and pumping wells with a daily average production of 6793 barrels. There was one gas well completed in the Pledger field, Brazoria County. The remaining seven completions were reported as failures.

LES STEGALL, scout for Shell Petroleum Corporation, Tyler, Texas, spent a few days in Houston during the past week.

KEY WELLS RECORD

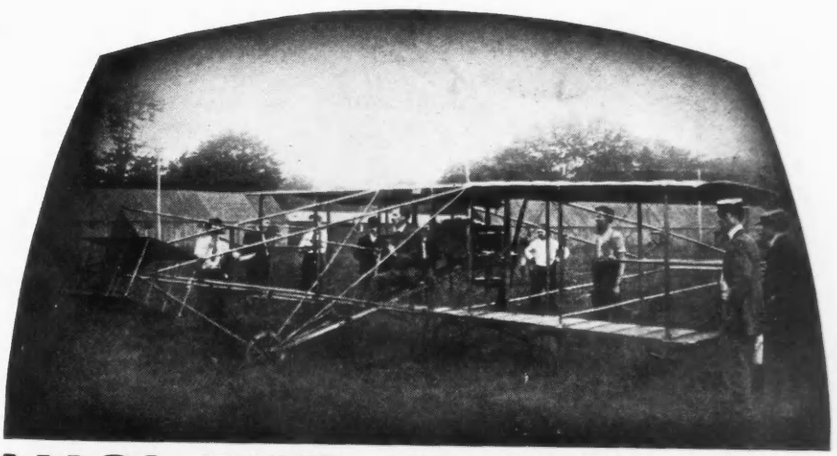
Potential flow for new proration quotas high

Tyler, Texas.—Potential flow of key wells used in the East Texas field by the Texas Railroad Commission as a basis for apportioning proration quotas attained a new record flow the past week.

Official reading given Chas. L. McMahon et al's Spear-Liard 14, A. Norris Survey, Gregg County, several miles northwest of Kilgore, rated the well at 1107.35 barrels per hour on two-hour open flow test. The well registered 25 pounds back pressure on casing and 50 pounds on tubing while the gauge was underway. It was completed last July after penetrating 28 feet on Woodbine sand.

Testing of the supplemental list of key wells was slated to be completed by the engineering staff of the commission Friday, and a new potential contour map of the field prepared for presentation at the statewide proration hearing set for the current week.

Key well gauges taken late in September and the fore part of October will be consolidated with the new group.



MAPS HAVE CHANGED . TOO

EDGAR TOBIN
AERIAL SURVEYS

SAN ANTONIO TEXAS

SIXTY-FOUR MILLION ACRES OF AERIAL PHOTOGRAPHIC MAPS

New Field Opened

FLOWING WELL COMPLETED IN ST. MARTINSVILLE AREA

Lake Charles.—Tide Water Oil Company's Smede 1, St. Martinsville prospect, Section 57-11s-6e, St. Martin Parish, which discovered a new field for the Louisiana Gulf Coast some time ago, was completed November 6, flowing 32 gravity oil at the rate of 8.4 barrels per hour from 5582 feet.

The well was tested on different size chokes. Through a ⅜-inch choke it made the above initial production, with 1975 pounds pressure on the tubing and 2090 pounds on the casing. The well also made 5,300,000 cubic feet of gas daily.

November 12, the well made 18 barrels per hour, with the casing closed and a ⅜-inch choke on the tubing.

Tide Water Oil Company has made location for Smede 2. It is 660 feet south and west from the discovery well, Section 57-11s-6e. The discovery well is located 990 feet from the north and east line of the Smede 282-acre tract in Section 57-11s-6e.

The operators have made no arrangements for a pipe line out of the field. It is assumed that the operators will barge the oil down Bayou Teche. The Tide Water Oil Company has erected two 1000-barrel storage tanks.

Tepetate Field Extended

The Tepetate field, Acadia Parish, was extended 4250 feet west and a little south when Continental Oil Company's Homeseekers 1, Section 29-7s-2w, came in from the regular pay horizon for 363 barrels in 11½ hours.

The casing was perforated from 8305 to 8312 feet, and the well came in through a ⅜-inch choke with a tubing pressure of 2100 pounds; casing pressure 1800 pounds. The well was also making 2,500,000 cubic feet of gas daily.

Homeseekers 1 is the fourth producer for Continental Oil Company to complete in the Tepetate field. It is located 660 feet west and 330 feet south of the NEc N½ SW¼ of Section 29-7s-2w.

The operators are drilling on three new wells in the field.

Continental Oil Company's Klump 1, which came in the previous week making 633 barrels in 14 hours from perforations at 8324 to 8334 feet, decreased to 77 barrels. The well is making 25 percent salt water. The operators are rigging up to kill the well and work it over.

Humble Oil & Refining Company's Kratzer 3, north offset to Kratzer 1, Section 11-9s-4w, Roanoke field, Jefferson Davis Parish, was drilling at 8155 feet in shale and lime, after taking a drill stem test at a shallower depth, showing salt water.

On a drill stem test from 7980 to 7993 feet the operators recovered 1740 feet of salt water through a quarter-inch choke in 10 minutes.

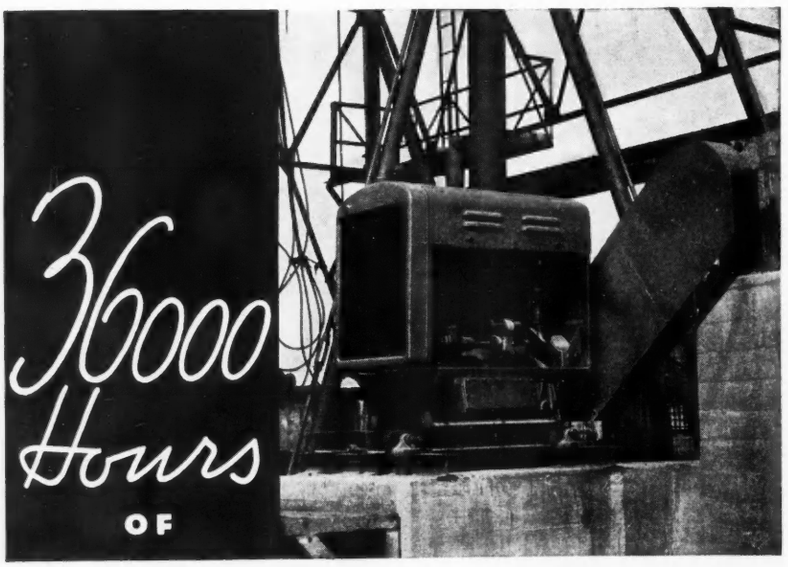
Magnolia Petroleum Company's Broussard 1, Willow Lake prospect, Section 13-12s-9w, Cameron Parish, was preparing to perforate five-inch casing up the hole from 9501 feet at the end of the week.

The operators had a showing of gas from 9240 to 9260 feet, and then drilled on down to 9501 feet and set five-inch casing at 9499 feet. The casing will be perforated at different horizons where the well has had showings of oil and gas.

LOUISIANA GULF COAST Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
CAMERON MEADOWS—		
Burton Sutton Oil Co., School Land 9	596	3600
LAKE HERMITAGE—		
Humble, Louisiana State 1	*	3995
TEPETATE—		
Continental, Homeseekers 1	626	8334
ST. MARTINSVILLE—		
Tide Water Oil Co., Smede 1	192	5582

*Failures; †Junked; ¶Million cu. ft. gas.



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WAUKESHA ENGINES

Rodessa Extended

NEW WELL PUSHES OIL AREA HALF MILE TO NORTHEAST

WEEKLY STAFF REPORT

Shreveport, La.—Last week a large commercial flowing oil well was completed one-half mile northeast of nearest Rodessa field oil production in what was identified as the "Dees" sand, the third and lowest of three gas producing horizons at Rodessa.

This new well is Vaughn Production Company's Hunter and Derryberry 1, NW NW 14-23n-16w, completed at 6026 feet, 14 feet in saturation, flowing 125 barrels of oil per hour through 1½-inch choke on tubing, giving Rodessa its fifteenth oil well since the discovery of oil there.

Some believe that farther to the north even the Hill, the upper gas horizon on top of the structure, and the Gloyd sand, the second gas zone, will produce oil. This, of course, remains to be seen, but a test spudded during the last week by Haynes Oil Corporation and Gov. O. K. Allen and James A. Noe in Embree Heirs 1, SE SW SW 9-20-28, Miller County, Arkansas, three miles north of production, should give an answer to this question. This test after spudding to 78 feet cemented 15½-inch surface casing at 60 feet. Haynes Oil Corporation has taken 640 acres of this 1200-acre lease and will drill the test.

Vaughn Well Swabbing

Meanwhile, one mile northwest of oil production, Vaughn Production Company continues to swab oil from Comegys 1, SE SE 10-23n-16w, after deepening the hole four feet to 6000 feet and logging top of the Dees sand at 5993 feet; elevation is 216 feet. This test has swabbed considerable oil, and has been rocked with gas, and every effort possible was made to get it to flow. A few heads of oil, one as long as 17 minutes duration, has been the best the well would show. The oil from the two Vaughn Production Company wells is slightly heavier than the oil from the Young oil sand, but not more than one or two degrees Beaume, preliminary tests indicated, and is still above 42 gravity. There has been that much variation of gravity in oil from other wells in the Young horizon.

The term "sand" when applied to the producing horizons is not a true term, as all of the oil and gas production comes from lime, some of which has more sand than others. There are in reality only two different producing horizons in the lime of the Glen Rose at Rodessa, an upper and a lower horizon. Some of the oil production has been found in true oolitic lime.

Late last week two other outpost wells at Rodessa gave indication of spreading the producing limits of the field in two directions. Both are owned by R. W. Norton of Shreveport, who drilled the first gas producer at Rodessa in 1930. His Foscue 1, NE SE 20-23n-16w, one mile west of the Young 1, discovery oil well, cored into saturated lime at 5982 feet and was still coring later at 6000 feet in the same formation; elevation is 220 feet. The test on top of the saturated lime was 22 feet lower than Young 1. Base of anhydrite in Foscue 1 was 5580 feet, and the anhydrite was topped at 5093 feet. Nine and five-eighths inch casing was cemented at 5147 feet.

One mile northeast of production Norton's Tyson 1, NW NW 13-23n-16w, logged top of the saturated lime at 6001 feet, and preparations were being made to set casing for a production test, with total depth of 6013 feet; elevation is 255 feet. The next producer expected in Rodessa is Haynes Production Company's Sexton 2, Section 14-23n-16w, which was drilling-in last week at 5951 feet. Anhydrite was logged from 5092 to 5607 feet in this test.

Six Locations Made

Six new locations were made last week in Rodessa, as follows: Haynes Production Company's Pitts 1, NE NW 14-23n-16w; Lawton 4, 14-23n-16w; United Gas Public Service Company's Ardis 2, SE SW 14-23n-16w; Rodessa Oil and Land Company 3, NW NW 23-23n-16w; Arkansas-Louisiana Gas Company's Rodessa Oil and Land Company 6, SW NW 23-23n-16w; and Pelican Oil and Gasoline Company's Sexton Unit 7, Section 14-23n-16w. This is the seventh test for a 120-acre lease.

Lease buying in Cass County, Texas, in the "Rodessa trend" continues to show some activity. Two recent purchases by Tide Water Oil Company showed a price of $225 per acre cash and $250 per acre in oil for the 53-acre lease of T. A. Howe, Jacob Carstner Survey, and an 80-acre T. A. Howe lease in the J. N. Jackson Survey, five miles from production. As far out of production as ten miles has seen $100 per acre paid. Sinclair-Prairie Oil Company has entered the Rodessa trend play and has a seismograph crew at work in Cass County.

Rodessa Drilling Report

Ark.-La. Gas Co.'s Rodessa O&L Co. 4, NW NE 23-23n-16w, dr 5063 ft shale; Rodessa O&L Co. 5, SW NE 22-23n-16w, dr 1239 ft. Rodessa O&L Co. 6, SW NW 23-23n-16w, dk.

American-Liberty Oil Co.'s J. B. Rogers 1, C. M. Robinson sur (Cass County, Texas), sr 2019 ft.

Bartex Pipe Line Co.'s B. H. Norton 1, CSE NE 18-23n-15w, spd setting surf csg; Sarah Bruner 1, NE SE 13-23n-16w, rur.

Danciger O&R Co.'s Willis 1, Lot 5, Blk 7, 23-23n-16w, spd & finishing rur.

Haynes Prod. Co.'s W. B. Lawton 3, nw se 14-23n-16w, dr 5557 anhydrite & shale; Sexton 2, 14-23n-16w, anhydrite 5092-5607 ft, cemnt 7-in csg dr plug 5857 ft; Sexton 3, NE SW NE 14-23n-16w, dr 4554 ft lime & shale; Sexton 4, SE SW SE 14-23n-16w, spd cemtd 12½-in csg 275 ft. Haynes Oil Corp. et al (O. K. Allen and James A. Noe), Embree Heirs 1, SW SW 9-20-28 (Miller County, Arkansas), spd. Haynes Prod. Co.'s Pitts 1, NE NW 14-23n-16w, mim. W. M. Layton's Tyson 1, SE NW 22-23n-16w, dr 5280 ft shale & lime.

Lion O&R Co.'s J. M. Wynn 1, NE SW 9-23n-16w, rur.

McAlester Fuel Co.'s Noah Tyson 1, SE NW 22-23n-16w, dr 4380 ft red shale & sand.

Monahan Oil Co.'s Comegys 1, SE NE SE 10-23n-16w, top anhydrite 5125 ft, dr 5741 ft; Comegys 2, 10-23n-16w, lcn.

R. W. Norton's Caddo Levee Bd. 2, NW SE 21-23n-16w, dr 4666 ft; Foscue 1, NE SE 20-23n-16w, top anhydrite 5093 ft, 9⅝-in csg 5147 ft, top saturated lime 5983 ft, arr core; Tyson 1, NW NW 13-23n-16w, cored saturated lime, arr test td 6013 ft; Dodd 1, C SE NW 13-23n-16w, mim; Lizzie Haywood 1 (440-ac), Priscilla Evans sur (Cass County), rur.

Pelican Oil & Gasoline Co.'s Sexton Unit 2, SW SE NE 14-23n-16w, dr 5150 ft; Sexton Unit 3, 14-23n-16w, dr 4402 ft; Sexton Unit 4, 14-23n-16w, spd setting surf csg; Sexton Unit 5, 14-23n-16w, spd; Sexton Unit 6, 14-23n-16w, spd dr 1000 ft.

United Gas Pub. Serv. Co.'s Ardis 1, SE SW SE 14-23n-16w, dr 4810 ft shale, streaks lime; Poole 1, NE NE 21-23n-16w, dr 4868 ft lime & shale; Ardis 2, SE SW 14-23n-16w, mim; Rodessa O&L Co. 3, NW NW 23-23n-16w, mim. United Prod. Co.'s Thurmond Unit 1, Jno. Coleman sur (Cass County, Texas), dr 5430 ft shale & anhydrite.

Grady Vaughn's Comegys 1, SE SE 10-23n-16w, elev 216 ft, anhydrite 5095-5714 ft, top Hill sand 5745 ft, 7-in csg 5924 ft, washed, swabbed, rocked with gas with some oil showing,, 5996 ft, deepened 4 ft to 6000 ft, swabbed, flowed oil by heads, swabbing oil td 6000 ft Dees sand; Comegys 2, 10-23n-16w, lcn; Hunter & Derryberry 1, sw ne nw 14-23n-16w, 5⅜-in csg 5900 ft, flowed 120 bbls hour through 1½-in choke on tub, completed td 6026 ft Dees sand. Hunter & Derryberry 2, 14-23n-16w, dk & mir.

LEASING IS ACTIVE

Rodessa causes interest in North Louisiana area

Shreveport, La.—A great deal of exploration work and leasing continues in North Louisiana as a result of developments in the Rodessa field.

About 10 miles southeast of the Zwolle field, Strake Oil Company of Houston, has taken geophysical and geological exploration options on approximately 42,000 acres of Peavy-Wilson Lumber Company land centering in township 5 north, ranges 9 and 10 west, Sabine Parish, with an obligation to drill a 4000-foot test on such land as is retained if exploration work warrants a test. A shooting crew is already at work on the block.

In Bossier Parish, G. A. Bringhurst of Alexandria, Louisiana, has assembled a 4500-acre block for a proposed 3000-foot test. The block centers in Section 26-21n-13w. In the same parish, Shell Petroleum Corporation bought a 275-acre lease from J. W. Elston Estate for $1380.

In DeSoto Parish, A. G. Halbach of Shreveport has assembled a 5000-acre block for a proposed 6000-foot test three miles southwest of the town of Grand Cane. In Winn Parish, R. A. Keaton has assembled a 5000-acre block for a pro-

posed 3000-foot test, the block centering in Section 29-10n-5w. In the old Spider district, DeSoto Parish, Kerr and associates of New Orleans, plan a test on a block of leases including considerable acreage owned by Whitney Corporation.

A Geophysical Service, Incorporated's reflection seismograph crew is working in DeSoto Parish between the towns of Mansfield and Logansport.

In Lincoln Parish, Dorfman and associates bought 200 acres in Section 19-17n-3w, paying five dollars per acre.

In Bossier Parish south of the town of Benton, C. T. Ruffin of Mansfield, Louisiana, is assembling a block.

In Ouachita Parish J. B. Williams who recently assembled an 8500-acre block and is rigging up for a test in SE NW 7-16n-4e, has assigned it to the Mid-Continent Production Company of Shreveport, but he will have charge of drilling the test which is planned for 6000 feet. Williams also plans to clean out and run an electrical test in an old test drilled in Section 16-16n-4w by C. H. Phillips. A string of 3500 feet of old casing is still in the hole.

GASSER IN FLAMES

No cratering danger as plans made to curb fire

Shreveport, La. — Triangle Drilling Company's Skannal Unit 1, NE SW NE 13-17n-12w, Sligo gas field, Bossier Parish, being drilled for oil below the oolitic lime gas horizon at 4200 feet in that field, blew out the night of November 14 in the 2800-foot gas level, got out of control, and caught fire.

Company officials on November 15 were studying methods of extinguishing the blaze, which destroyed the heavy rig.

The gas flow was estimated at fifty million cubic feet daily.

There is slight chance of the well cratering, as 13⅜-inch casing has been cemented at 749 feet.

NORTH LOUISIANA

Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
CADDO PARISH (Rodessa)—		
Vaughn Prod. Co., Hunter & Derryberry 1, 14-23n-16w	3000	6026
CADDO PARISH—		
A. D. King, Roach 1, 4-14n-16w ...	*	2712
CATAHOULA PARISH—		
McIntyre et al, Tensas Delta Lbr. Co. 1, 18-10n-7e	*	3008
UNION PARISH (Monroe)—		
Nemours Corp., Haile 2, 1-21n-3e ...	¶¼	2190

*Failures; †Junked; ¶Million cu. ft. gas.

Two Tests Watched

LAFAYETTE COUNTY WELLS RUNNING HIGH OR SHOWING

WEEKLY STAFF REPORT

El Dorado, Ark.—Two wildcat tests in La Fayette County, Arkansas, were holding considerable interest last week, each being in a separate horizon.

Transportation Petroleum Company's Cochrane 1, NE SE 26-19-25, was arranging to cement 6⅝-inch casing at 3330 feet after logging nine feet of sand identified as Tokio or upper Woodbine at 3338-47 feet. Elevation is 256 feet. Operators said the sand showed oil saturation and they planned to set casing without a drill stem test. Annona chalk was logged from 2337 to 2690 feet. A previous hole drilled three-quarters of a mile southwest of the present location had 14 feet of sand that showed oil in a drill stem test at 3358 feet, the operators said. This test, however, has been drilled to 4400 feet with 6000 feet contemplated. These tests are on a fairly solid 6000-acre block.

The other La Fayette County test was Joe Modisett and associates' Frost Lumber Company 1, SW SW 29-19-24, which logged anhydrite at 4924 feet and then picked up massive anhydrite at 5100 feet. It logged what was identified as shale at 5240 feet after passing out of the anhydrite. Elevation is 261 feet. This test logged top of the Arkadelphia at 1653 feet.

In Columbia County, Arkansas, Olds and associates are assembling a block for an early 6000-foot test. The block centers around Section 12-17s-22w, where Fullenwider and associates several years ago drilled a test to 2994 feet and abandoned it in gummy shale. In this same county Phillips Petroleum Company continues to take scattered leases, having leased recently 100 acres in Section 19-18-22; 60 acres in Section 25-18-23; 120 acres in Section 30-18-22, and 80 acres in 20-18-22. Tidewater Oil Company has a seismograph crew working in this county. Previous reports have been made of other crews working in that county.

Some lease buying is going on in La-Fayette County. In Section 21-16-23, Ohio Oil Company bought mineral rights on 80 acres and East Texas Petroleum Company took a 40-acre lease in Section 5-19-26.

A great deal of lease buying in Columbia and La Fayette Counties followed discovery of oil at Rodessa. Magnolia Petroleum Company, Sun Oil Company, Shell Petroleum Company, Phillips Petroleum Company, Gulf Refining Company and Tidewater Oil Company are among companies who have bought leases in Columbia County since discovery of oil at Rodessa.

ALABAMA ACTIVITY

Leasing and re-drilling feature oil play there

Mobile, Ala.—Reports are current here but not officially confirmed that Danciger Oil & Refining Company, now shut down at 700 feet in U. S. Government 2, Fort Morgan Reservation, Baldwin County, Alabama, is negotiating with land owners in that county, where this company has a considerable block, to drill a series of six tests. The present operation is the company's second test on the block.

Ohio Oil Company, which several years ago drilled a test below 5500 feet on a block in Mobile County, is paying rentals on approximately 3000 acres of the original block.

P. J. McAlpine and Frank P. Borden, of Amory, Mississippi, have re-leased the acreage, amounting to over 17,000 acres, around Pittsburgh Oil & Development Company's Hobson et al, Section 26-8s-14w, Franklin County, Alabama. They went back into the old hole, on which McAlpine was drilling contractor, and which went to 4000 feet. They cleaned the hole to 2600 feet, set a string of 8¼-inch casing at 1386 feet, and later shot the well at 2567-81 feet, using 20 quarts and planned later last week to shoot it again. The hole was originally drilled in 1927.

A. R. Willis and R. F. Payne, who have drilled to 730 feet in R. C. Jett 1, NE¼ 6-21n-1e, Greene County, Alabama, as a test for geological data, may drill the well deeper, as an oil and gas test, it is reported.

C. H. Palmer has assembled a block of approximately 12,000 acres on the Hatchetigbee Anticline, in Choctaw County, Alabama, near Bladen Springs, with the block apparently centering along the supposed axis of the anticline, which runs southeast-northwest.

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Large Open Flow

MONUMENT WELL GAUGES 360 BARRELS PER HOUR

WEEKLY STAFF REPORT

Hobbs, N. M.—Indicated prolific crude yield registered by Jeffers Oil Company's C. Britt-Conoco 1, C SE NW 7-20s-37e, southeast outpost for the Monument field, on drill stem test from lime at 3820-81 feet was greatly exceeded when completion gauge revealed a natural flow of 360 barrels of pipe line oil per hour via open 6⅝-inch casing.

Following the installation of 2½-inch tubing at 3873 feet the well gauged 268 barrels per hour through open casing and tubing, with gas volume rated at 2,200,000 cubic feet daily. The well was estimated at 2000 barrels oil daily, as previously reported, when formation tester was used prior to cementing casing at 3803 feet. It is the largest natural producer on the huge structure, although several acid treated wells held by Amerada Petroleum Corporation scored a higher initial rating.

Amerada Petroleum Corporation has resumed development of its discovery leasehold at Monument, with operations getting underway on State 1-H, C SW SE 1-20s-36e, and State 1-J, C NE NW 2-20s-36e. Gypsy Oil Company's B. V. Culp 2, C SW NW 19-19s-37e, found usual porosity lacking in the regular lime pay zone in drilling to 3985 feet, where the hole swabbed dry, and produced only 96 barrels oil daily after treatment with 2000 gallons of acid. It has since been deepened to 4000 feet, or 291 feet sub sea. Swabbing operations were underway late last week. It is in the northeast extension area, and offsets wells that scored steady flow without the aid of acid.

Republic Production Company's Selby-Maveety 1, C SE SW 35-19s-36e, extended production one location to the west with an initial gauge of 100 barrels of oil hourly through one-inch choke on tubing from lime at 3940 feet, or 326 feet below sea level, after using 4000 gallons of acid. Production was mostly gas before the acid solution was employed.

East flank of the most densely drilled portion of the Eunice field contributed a heavy producer the past week when Empire Gas & Fuel Company's State 2-C, C SW SW 16-21s-36e, gauged 252 barrels oil per hour flowing through 7-inch casing with drill pipe in the hole. Gas volume was estimated at 3,500,000 feet daily. Production is from lime at 3840-3850 feet. The hole was drilled to a minus depth of 210 feet. Work has been started on State 3-C, C NE SW 16-21s-36e, as a south offset to Skelly Oil Company's State 5-B. Other new locations assigned the field last week included Continental Oil Company's State 8-C, C NW SW 20-21s-36e, and Humble Oil & Refining Company's State 7-B, C SW SE 29-21s-36e.

Atlantic Oil Producing Company's State 2-E, C NW SW 5-21s-36e, northwest outpost producer, took first rank among the large wells in the north portion of the field by flowing 96 barrels per hour, natural, through tubing from lime at 3856 feet. This company's State 2-H, C Lot 16, same Section, was flowing 22½ barrels hourly while drilling in with pressure control equipment, and derrick has been erected for State 4-H, C Lot 9.

Skelly Oil Company et al's B. F. Harrison 1, C NE SW 5-23s-37e, wildcat situated east of the production trend between Jal and Monument areas, was drilling in lime at 3000 feet. Seven majors and large independents formed a 12-section unit block to support this test, with each holding a working interest. Operations were halted in brown lime at 2722 feet to cement 8⅝-inch pipe and change from rotary to cable tools, as production will most likely prevail in sand-lime formation.

Plugging orders have been issued for Phillips Petroleum Company and Pure Oil Company's Woolworth 1, Lease 2, C NE NW 33-24s-37e, situated about 3½ miles east of the Cooper field, after getting negative results on four drill stem tests at 3540 feet. It was drilled to sulphur water in the lime at 4200 feet, and plugged back to the above level. The partnership's Woolworth 1, Lease 4, C SE SW 8-25s-37e, west offset to a small wildcat oil producer, produces about 10 barrels oil, plus five barrels wash water, and 1,500,000 feet of sweet gas daily from sand-lime formation at 3441 feet. Nitro will be used to stimulate the oil yield.

In the southeast portion of the Jal district, The Texas Company, Amerada Petroleum Corporation and Columbian Carbon Company are starting operations on Cagle 1-B, C NW SW 15-26s-37e.

NEW MEXICO

Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
SAN JUAN COUNTY (Rattlesnake Field)—		
Continental Oil Co., Navajo Tribal 47, nw 2-29n-19w	246	741
LEA COUNTY (Cooper Field)—		
Stanolind, A. E. Meyer 1-B, c nw ne 26-24s-36e	1800	3530
LEA COUNTY (Eunice Field)—		
Atlantic O. P. Co., State 2-E, c nw sw 5-21s-36e	3000	3856
State 1-J, c se ne 29-21s-36e	1300	3940
Skelly Oil Co., State 4-B, c nw ne 16-21s-36e	3000	3900
Empire G&F Co., State 2-C, c sw sw 16-21s-36e	6000	3850
LEA COUNTY (Monument Field)—		
Jeffers Oil Co., Britt-Conoco 1, c se nw 7-20s-37e	8000	3881
WILDCATS		
LEA COUNTY—		
Phillips Pet. Co.-Pure Oil Co., Woolworth 1, lse 2, c ne nw 33-24s-37e	*	4200

*Failures; †Junked; ¶Million cu. ft. gas.

N. R. A. CONFERENCE

WASHINGTON, D. C.

STERILIZATION of the NRA conference called by George L. Berry, coordinator of industrial cooperation, for December 9, was seen here today in reports that while there will be no governmental interference with the discussions of the meeting, the administration does not feel itself bound to accept or even consider any suggestion which may result from the deliberations if they do not coincide with its plans for future federal control of industry.

In a move to stem the tide of opposition to another NRA, after April 1, next, when the present law expires, officials let it be known that the Berry conference, if it gets out of hand, will be considered merely as a "town hall" meeting.

Indications that President Roosevelt is desirous of continuing the NRA after next March and is developing plans for new legislation to make it effective are seen in the reported failure of the Federal Trade Commission to secure from the White House funds with which to proceed against industries which are still continuing the monopolistic practices permitted under their former codes.

AMORY GAS FIELD LOW

Depletion of production seen for first gas area

Jackson, Miss.—Possibility that other tests may be drilled soon in the Amory gas field, Monroe County, northeast Mississippi, the first gas field in Mississippi, or the field will be entirely depleted, is seen in reports received here that the best of three gas wells still producing small amounts of gas is only yielding 250,000 cubic feet daily, with a pressure of 65 to 85 pounds.

Some time ago towns being served from the field had to tie into the Monroe, Louisiana-Birmingham, Alabama, trunk line for a fuel supply. The field was discovered in 1926, and at one time four wells were making gas in commercial quantities.

Jeva Winter and Howard and Golsan, the latter two having drilled a test in this county several years ago, have assembled approximately 30,000 acres of leases in Chickasaw County, north Mississippi, in townships 12 and 13 south, ranges 2 and 3 east. Neil McCaskill, cable tool operator, formerly of Texas, is trying to clean out an old hole drilled by Danner Gas & Oil Trust Company in Flaherty 2, Section 8-13s-2e, in 1923, to a reported depth of 2462 feet.

Wyoming Wells Big

HEAVY FLOW FROM SUNDANCE FORMATION IN TWO DISTRICTS

Casper, Wyo.—Two large wells producing from the Sundance horizon came in last week in Wyoming.

The joint well of the Ohio Oil Company and the California Company, State 2, C NW NW 36-21n-79w, Big Medicine Bow structure, Carbon County, was one of the important new producers.

A week ago that well made 135 barrels per hour along with 16,000,000 cubic feet of gas in the upper Sundance (identified by some geologists as the Morrison) at 5474-5505 feet. The well had 27 more feet of saturated sand in the upper formation which was untested.

State 2, the second well on Big Medicine, is considerably larger than Kyle 1, NE SE NE 26-21n-79w, which had an initial of 6360 barrels of 64 degree gravity oil and 20,000,000 cubic feet of gas from the lower Sundance at 5299-5361 feet, and 61,000,000 cubic feet of gas, an estimated 1500 to 2000 barrels daily of distillate from the upper Sundance at 5151-5222 feet.

The new well is located a mile south and quarter mile east of the discovery. The well logged the upper sand 385 feet down structure from Kyle 1. Though some doubt existed as to whether Big Medicine Bow would make a field, many observers taking the view that the high gravity crude and freak character of production in Kyle 1 indicated that only gas production might be developed at Big Medicine, this doubt has been entirely erased by the performance of the second well, and Rocky Mountain oil men believe that Big Medicine Bow with its 12,000 acres will form one of the territory's major oil sources.

Same joint companies' Union Pacific 1-Account 1, NE SW SW 24-21n-79w, is drilling in the Frontier formation at 4100 feet.

Big Lance Creek Well

Continental Oil Company's Joss 3, C EL NW NE 6-35n-65w, Niobrara County, eastern Wyoming, made one of the largest Lance Creek completions to date. The well flowed 135 barrels an hour through the 2½-inch tubing at 3927 feet. The well had 74 feet of producing sand, highly saturated, in the lower Sundance at 3845-3929 feet. The seven-inch O.D. production string is set at 3840 feet. Hole bottoms at 3937 feet.

Sand line and swab were recovered early this week in the J. M. Huber Corporation's Jose 1, NE SE NW 6-35n-65w, which is waiting on cement to set after plugging back to 4037 feet. The well, located on the west steep dip side of the structure, a quarter mile from the nearest production, developed water in the bottom of the lower Sundance between 4042-72 feet. The well cored highly saturated oil sand between 4024-42 feet and it is believed that it will make a good well, though the water saturated cores below indicate that the well is near the water table.

Ohio Oil Company's Elizabeth Lamb 7, CEL NW NE 5-35n-65w, is drilling 3129 feet in the soft shale.

Rock River Pumper

The Ohio Oil Company is completing a second pumper in the recently discovered Sundance pool underlying the old Rock River field, Carbon County. The well, which had water in the lower part of the Sundance at 3223 feet indicates that the Sundance area at Rock River will be closely confined. Ohio's Diamond Cattle 5, NWc SW NW 32-27n-88w, swabbed 180 barrels in the first 24 hours in Sundance at 2633-3163 feet after plugging back. The well is rigging up for a pumping test. It was originally completed in the Dakota at 2832 feet, April, 1922, for 1000 barrels initial.

California Company's Holst 2, SW NE SE 13-17n-77w, at the Quealy Dome seismograph discovery, Albany County, is drilling below 4100 feet after several days shut down repairing boilers at 4085 feet. The well is near the Sundance sand, which is untested at Quealy. Production has been developed in the Muddy and Dakota sands in the discovery well, and saturated cores were recovered in these sands in the present well, which did not stop to test. Company's Wilson 1, NW SW SW 18-17n-76w, is shut down at 1010 feet for water.

Deep well to the untested Sundance sand at Dutton Creek, Union Oil Company of California and S. H. Keoughan's Union Pacific 1, NE SW SE 1-18n-78w, Carbon County, is drilling at 850 feet with rotary equipment.

Mid-American Oil Company's Government 3, NWc NE SW 14-28n-92w, Sheep Creek field, Fremont County, is near its first objective the Embar lime, drilling at 1750 feet. The well will drill into the Tensleep sand, which is usually found productive in Wyoming fields where Embar production is developed. The discovery well, Government 2, at Sheep Creek, was not carried to the Tensleep.

Two wells are due for early completion and as far as may be judged from the thickness of the producing horizons and porosity of formation in cores recovered both wells should make large completions in their respective fields.

California Exploration Company's Government 2, SW NW 7-44n-96w,

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HOUSTON, TEXAS

MOUNTAIN STATES

Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
MONTANA		
GLACIER COUNTY (Cut Bank Field)—		
Texas Co., Carrie Long 2, ne sw 23-35n-65w	158	2856
BIG HORN COUNTY (Hardin Field)—		
Big Horn Oil & Gas Co. 22, ne ne sw 22-1s-33e	¶⅛	610-45
23, ne ne se 23-1s-33e	¶⅛	649-60
FALLON COUNTY (Baker-Glendive Field)—		
Montana-Dakota Utilities Co. 74, ne se sw 34-10n-58e	¶8	800-943
WYOMING		
SUBLETTE COUNTY (LaBarge Field)—		
Texas Co. 3-C, se nw 34-27n-113w	30	914
NIOBRARA COUNTY (Lance Creek Field)—		
Continental Oil Co., Joss 3, nw ne 6-35n-65w	2640	3937

*Failures; †Junked; ¶Million cu. ft. gas.

Water at Montebello

TWO IMPORTANT TESTS GET UNSATISFACTORY SHUT-OFFS

WEEKLY STAFF REPORT

Los Angeles.—The week just passed witnessed several important developments in the easterly extension of the Montebello field, located about 10 miles east of Los Angeles.

Universal Consolidated Oil Company's Estrada 1 was completed November 2 for an initial of 1600 barrels per day of 38.2 gravity oil, cutting 1.1 percent water, and two-million cubic feet per day of gas. This flow was through one 44/64-inch bean, with flow pressures of 375 pounds on the tubing and 1000 pounds on the casing. Total depth is 5608 feet, with water shut-off approved on the nine-inch casing cemented at 5550 feet. However, operators believe that water has broken in since completion, as production on November 9 had dropped to about 900 barrels per day rate (with comparable bean sizes) and water cut was varying between 0.1 to 10.0 percent, with an occasional slug of water that would bring the cut up to almost 50.0 percent for a short time. It will, no doubt, be necessary to work on the well further.

The Texas Company's Baldwin 13 tested wet on shut-off test of the 11¾-inch casing cemented at 5365 feet and a bridge has been placed at 5373 feet, in preparation to squeezing cement around the casing shoe. Total depth is 5781 feet and with the hole open to 5444 feet this well flowed for five hours at 1200 barrels per day before sanding up.

Signal Oil & Gas Company's Lapworth 1 is also looking very good. With depth at 3102 feet, bottomed in oil sand with streaks of shale, formation tester was run but proved a mechanical failure. However, operators are so confident of obtaining a commercial well that they plan to deepen another 10 feet or so, run casing, and make a regular production test.

The most important wildcat development in the Los Angeles Basin district during the past week was abandonment of Continental Oil Company's Santa Ana Community 1, wildcat project located in Section 14-5s-10w, about one mile west of the town of Santa Ana, Orange County.

This test was bottomed at 4411 feet and penetrated no oil or gas showings during its entire drilling. Majority of the formations penetrated below 3000 feet were hard gray sand, which sand body was still present at bottom.

Another edge test of the Dominguez field, located about 15 miles south of Los Angeles, is to be made soon.

Continental Royalties, Limited, has just taken over an 80-acre lease on the northeasterly edge of this field, on the property where Julian Petroleum Company drilled its Pico 1 about 12 years ago to a depth of 4811 feet without encountering anything of commercial importance.

It has not yet been decided whether this old well will be cleaned out and deepened, or whether a new well will be drilled.

J. E. O'Donnell, prominent Southern California operator, is preparing to deepen the old Consolidated Crude Corporation, Bloemer-Jeppi 1, in Section 17-30s-29e, located about midway between the northerly ends of the Mountain View and Edison fields, Kern County.

This test, drilled about one year ago to a depth of 5567 feet, showed practically all water from formations on bottom and was plugged back and tested several times, last plug being at 5514 feet. It has been standing idle since April of this year.

Water shut-off is with seven-inch casing, cemented at 5240 feet.

Another wildcat test of the Mount Poso district, Kern County, was written off as a "Dry Hole" last week.

John C. Gamba's Gamba 1, Section 4-27s-28e, outpost well just beyond the extreme easterly edge of the northerly portion of the Mount Poso field, was abandoned on November 8.

This project was drilled to 2052 feet, formations on bottom being barren gray sand belonging to the Vedder formation, top of which was penetrated at 2047 feet.

Another link in the chain of dry holes that definitely establish the limits of gas production in the Semitropic district, Kern County, was added last week when Standard Oil Company abandoned its H. & C. 1, in Section 9-27s-23e.

CALIFORNIA
Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
KERN RIVER—		
Standard Oil Co. No. 5	105	2821
MOUNTAIN VIEW—		
Wood-Callahan Oil Co., National 1	1580	5884
MOUNT POSO—		
General Pet. Corp., Heisen 49	325	1715
PREMIER—		
Ohio Oil Co., Premier 8	255	2813
VENTURA AVENUE—		
Associated Oil Co., Hartman 19	105	7308
LONG BEACH—		
Pierce Pet. Corp. No. 1	200	5200
Union Oil Co., L.B.C. 27	60	2750
BALDWIN HILLS—		
Standard Oil Co., K&I Rubel 21	1440	3950
L.A. Inv. 77	575	3122
RICHFIELD—		
Viking Oil Co., Wagner 1	25	4721
SANTA ANA—		
Continental Oil Co., Santa Ana Com. 1	*	4411
KERN COUNTY—		
General Pet. Corp., Mattson 1	*	8847

*Failures; †Junked; ¶Million cu. ft. gas.

This well was originally drilled to 4602 feet but was unable to obtain commercial production and was plugged back and redrilled to 3990 feet. The second attempt was also unsuccessful and the well has been abandoned.

Bankline Oil Company has uncovered some interesting showings on the easterly edge of the old Shiells Canyon field, Ventura County, in its Calumet B-1, Section 3-3n-19w.

A production test was made in this well on November 5, at which time a flow of 30 barrels per hour, 37.0 gravity, 10.0 percent drilling mud and water cut, was obtained for five hours, after which the well died. Preparations are being made to place it on the pump.

This project, located in an area where production from a zone just above 2000 feet has been obtained for many years, is bottomed at 3634 feet, with 8⅝-inch casing cemented at 3553 feet.

The zone was first discovered by The Texas Company in its Shiells 128, located near the center of the old field, but was passed up in that well and cemented behind casing.

Shell Oil Company abandoned its Covarubias 2-1, located in the small El Capitan field about 10 miles west of the Elwood field, Santa Barbara County.

This well, located on the edge of one of the most prolific small fields in the Coastal district, was bottomed at 3242 feet, and 8⅝-inch casing was cemented at 3067 feet. However, all efforts to place this well on commercial production were unsuccessful, fluid being practically all water, with just a trace of oil.

DOS PALOS GAS AREA
Third Pure Oil Company wildcat is rigging up

Los Angeles.—Pure Oil Company is rigging up rotary equipment for its third test of the Dos Palos gas area, located in Madera County, about 50 miles north of the Coalinga oil field.

Pure Oil Company's second well, Chowchilla 2, Section 8-10s-14e, now being deepened at 3160 feet, recently uncovered some very promising gas showings in the upper zones, which were disregarded in the discovery well, Chowchilla 1, located slightly less than a mile to the west.

Chowchilla 2 made several formation tests between depths of 2387 feet and 2800 feet, recovering gas in amounts varying from 1,200,000 to 15,000,000 cubic feet per day rate of gas. In drilling Chowchilla 3, it is Pure Oil Company's intention to carry it only to about 3000 feet, making a thorough test of the zones above that point where the good showings were penetrated in No. 2, mentioned above.

Pure's discovery well, Chowchilla 1, Section 7-10s-14e, was drilled to 8375 feet, but formations near bottom carried considerable water and the hole was plugged back to 8125 feet, where it was completed for 12,000,000 cubic feet per day of gas. Present plans are to deepen Chowchilla 2 to the same zone from which the discovery well was completed. However, where the first well drilled a large section of the intermediate formations, Pure Oil Company will core all of those formations in this second test and make sure that no additional gas or oil zones have been overlooked.

Waugh Dome, a 1934 discovery with one producing well, Hot Springs County, is coring at 4235 feet, feeling ahead for the Tensleep sand. The well recovered saturated lime in the Embar topped at 3890 feet at 3939-54 feet. It cored a saturated sand streak at 4017-4037 feet, and saturated lime at 4040-46 feet before entering hard lime above the Tensleep.

Ohio Oil Company's P. G. Sessions 3, NWc 35-56n-97w, Garland field, Big Horn County, topped saturated lime at 3947 feet in the Madison formation and stopped at 4234 feet still in the saturation. The well is shut down waiting on cement to set around the seven-inch O.D. string set at 3925 feet.

Ohio's Byron Union 4, CSW NE 22-56n-97w, Byron field, Big Horn County, is drilling at 1945 feet. Sidney H. Keoughan's Hoskins 1, NW NW 25-56n-92w, Byron field, drilling for the account of the Taylor Oil Company on an acreage production basis, resumed operations this week and set whipstock 450 feet off bottom to drill by lost drill stem. Total depth is at 1575 feet where well has been shut down for the past several months.

Yale Oil Corporation's Allen 1, SE NW SE 33-56n-97w, Garland field, Big Horn County, is drilling by lost reamer with whipstock set at 3250 feet. Peay Oil Company's Fee 1, NE NE NE 15-65n-97w, south Garland fault block, Park County, is shut down at 3400 feet.

Ohio Oil Company's Mill Iron Cattle Company 72, NE SE SE 19-46n-98w, Grass Creek, Hot Springs County, is drilling red beds at 3410 feet. Stanolind Oil & Gas Company's Ridgely 20, CSE NE 19-46n-98w, is still a rig and will not start drilling until completion of the Ohio's well to the Tensleep at Grass Creek.

Christinsen and Thorne's Government 2, NW SW SW 31-48n-90w, Hidden Dome field, Washakie County, is drilling at 210 feet. Arlt and Doyle's Government 1, SW SW SE 29-48n-90w, is drilling at 913 feet.

W. S. Gilbert's Government 1, SW SW SE 29-48n-90w, is drilling at 913 feet. Test is in the Lamb anticline field, Big Horn County.

Western Wyoming Routine

Mountain Fuel Supply Company's Brooks 1, C NW NE 15-16n-104w, South Baxter Basin field, Sweetwater County, is drilling at 1033 feet.

In the Spring Valley field, Unita County, W. D. Marshall's Government 1, NW SW SE 12-15n-118w, is drilling at 785 feet. Intermountain Petroleum Company's Union Pacific 1, SW NW SW 24-14n-118w, is drilling at 1558 feet. Ragan Petroleum Corporation's Fee 4, NW SW NW 13-15n-118w, an old well deepening from 853 feet is drilling at 1018 feet.

Senrab Oil Company's Government 3, N SE NW 10-26n-113w, LaBarge field, Lincoln County, is drilling at 1032 feet.

W-K-M Company announces it is now the exclusive distributor for the Lacy turbolite turbo generator and Lacy bug fan, for both domestic and export sales, and is selling these products through all supply stores.

New Test Pumping

LOCATIONS STAKED NEAR SAGINAW COUNTY WELL

WEEKLY STAFF REPORT

Mt. Pleasant.—King Drilling Company's Kube 1, Saginaw County wildcat test, 12n-2e-31, was averaging from 6 to 10 barrels an hour this week, after being put on a pump test after tubing. The test came in wild four weeks ago in the Traverse formation at 2738 feet, 108 feet in the lime, but after producing about 1200 barrels of oil went dead. At least two more locations are due to be made in the area within the month.

Possibility of a Traverse lime pool in Ferris township, Montcalm County, loomed this week in J. H. Hibbard's Sartor 1, 11n-5w-22, a mile northwest of production from Traverse lime. Operators refused to divulge pay tops or botton hole depths. The industry at large failed to show a great deal of heat, even in view of the early flow estimated at 50 barrels an hour. Other Traverse wells in the proven Crystal-Ferris area of deeper Dundee production "flashed" but quickly went to water.

Three widely separated deep oil tests which failed to show commercially in Dundee lime are now being plugged back to oil and gas shows in the Upper Lime or Traverse. These are M. J. Ingold's Webb 1, 22n-9w-13, Wexford County; Mel Fordyce's Suszko 1, 18n-3e-11, Bay County, and Rex Oil Company's Newland 1, 12n-8w-2, Montcalm County. Of the three the Bay County test is developing the most interest. It was estimated good for 15 to 30 barrels in the Traverse lime at 2029-73 feet, showing 37 feet of oil saturation of the lime. None of the tests appeared commercial, however, in the Traverse but operators are planning to try acid treatment.

COURT HEARING
Trial of suit involving state lands November 16

Mt. Pleasant.—Hearing of a suit in which the right of the State of Michigan to reserve minerals, oil, and gas on state lands reverting to the state through delinquent taxes, as postponed until November 16 in the Ogemaw County circuit court.

Nick Krench of Detroit, filed suit against the Fortney Oil Company, the State, Simrall Pipe Line Company, and Nap-Sol Refining Company, charging the act of 1909, reserving oil, gas and minerals to the state, and giving the state the right to lease, as unconstitutional. At present there are 85,000 acres of state lands under lease to individuals and corporations, on which there are 30 oil and gas wells. Royalties and bonuses have in the past five years brought the state upwards of a half million dollars, with a present income of about $3000 per month.

The suit in particular involves Fortney Oil Company's State B 1 well and an 80-acre lease in Horton township of Ogemaw County.

NEW LOCATIONS MADE
Three tests will offset Karst discovery well

Russell, Kansas.—Three new locations have been staked as offsets to the discovery well in the Karst pool, 12 miles south of here, in southwestern Russell County. All are in the same section.

Skelly Oil Company's Emanuel Karst 1, SE NE NW, is a northwest diagonal offset; Barnsdall Oil Company's Emanuel Karst 1, NE SE NW, is a west offset; and Derby Oil Company's Emanuel Karst 1, SW NW NE, is a north offset.

The discovery well and only producer in the new pool to date was Nassau Petroleum Company's Emanuel Karst 1, NW SW NE 27-15s-14w, completed in August of this year for a optential of 287 barrels from siliceous lime at 3315 to 3319 feet, the total depth.

An attempt to extend production to the northwest in the Gorham area, eight miles west of here, resulted in failure last week, when Johnson et al's Mermis 1, NE NE SW 29-13s-15w, found a small showing of oil and 250 feet of water in siliceous lime at 3370 to 3375 feet, the total depth. Top of the Oswald lime was encountered at 3068 feet; the 6⅝-inch casing was cemented at 3165 feet; a hole full of water was reported at 3286 feet, and top of the Gorham sand at 3348 feet. The 5 3/16-inch string was set at 3349 feet.

PLUGGING BACK

Shreveport, La. — Amerada Petroleum Company last week after drilling to approximately 6900 feet in Weil 1, Section 53-1s-2e, Rapides Parish, Central Louisiana, plugged back and perforated seven-inch casing that had been set at 6015 feet to re-test an oil showing at base of the Cockfield at 5704-52 feet. At the latter level on a drill stem test this well showed three thribbles of oil and one thribble of salt water.

COLORADO ACTIVITY

Test in Price District yields showing of oil

Denver.—The second test in the Price district, Archuleta County, southwestern Colorado, which had an oil well completion a week ago, is showing oil. The well, William E. Hughes estate Fee 3, NW NW SE 25-33n-2e, is drilling at 855 feet with a good show of oil at 844 feet.

A week ago the Estate's Fee 2, SW SW 24-33n-2e, Price anticline, pumped 50 barrels in the first 24 hours. Production is coming from a sand identified as the Tocito member of the Mancos shale. The sand was topped at 1085 feet, and hole bottoms at 1120 feet. The well is believed to have opened up a new shallow light oil field for Colorado.

Continental Oil Company's Hoye 3, NWc NE 34-9n-78w, Jackson County, had trouble with carbon dioxide as other south McCallum wells, and passed through the lower Dakota at 5079-5100 feet, failing to get an adequate production test because of the freezing power of the gas. The well is coring ahead at 5130 feet for the Lakota sand.

Stanolind Oil & Gas Company's Parkinson 16-X, SE NW NW 23-4n-92w, Iles field, Moffat County, northwestern Colorado, is cementing the eight-inch casing at 3428 feet. Hole bottoms at 3432 feet in the upper Sundance, which was topped at 3425 feet. The well will drill into the lower saturated Sundance for completion. The top of the Sundance is dry at Iles.

MICHIGAN

Completions

Company, Well and Location	Init. Prod. Bbls.	Depth
ISABELLA COUNTY—		
Chariers Oil Co.'s West 1, 15n-4w, se se-12	15	3710
O'Neal and Sarver's Border 1, 12n-4w, c se se-31	*	1515
T. T. Hawksworth's Dimon 1, 15n-3w, nw sw nw-34	175	3700
Morris Oil Co.'s Marthey 2, 15n-3w, ne nw se-19	100	3659
GRATIOT COUNTY—		
Jackson and Myer's Garner 1, 9n-4w, ne ne se-10	*	3180
MECOSTA COUNTY—		
Wiser Oil Co.'s Garner-Wilson 1, 13n-7w, c sw nw-34	¶12½	1300
Gordon Oil Co.'s Dieban 1, 13n-7w, c nw sw-30	¶12½	1297
Fletcher & Leyman's Grewe 1, 13n-8w, c se se-24	*	1500
Columbia Oil Co.'s Stebbins 1, 13n-8w, c ne se-25	¶5½	1340
MIDLAND COUNTY—		
Pure Oil Co.'s State-Porter 3, 13n-1w, se ne se-15	20	3412
Yatts 2, 14n-2w, c se se-35	150	3425
Root D-1, 13n-2w, c se se-2	100	3410
MONTCALM COUNTY—		
Stork Oil Co.'s Dickenson 4, 10n-5w, ne nw se-3	800	3188
Gordon Oil Co.'s Strait 4, 10n-5w, ne se nw-3	75	3198
A. R. Morris' Pugsley 1, 11n-5w, nw ne sw-26	100	3240
Pugsley 2, 11n-5w, sw ne sw-26	*	3249
Pugsley 3, 11n-5w, se ne sw-26	40	3262
W. J. Bernier's Strait 2, 11n-5w, se nw sw 35	35	3200
OGEMAW COUNTY—		
Goll-Graves-Mechling's Kerr 1, 23n-3e, sw sw se-27	*	2880
Webber Oil Co.'s Boeing 1, 22n-2e, ne sw se-36	25	1890
Redman Oil Co.'s Wobig 2, 21n-3e, ne nw se-6	30	2620

*Failures; †Junked; ¶Million cu. ft. gas.

Executive Committee Report

[*Continued from page 12*]

way from sanitary measures to partnerships in building bridges and tunnels, and to distributing the impounded waters of the Colorado River. The interstate oil compact has so recently been set up that no conclusive test of it can be reported; but in view of the enlightened and cooperative attitude of the state governments, there is every reason for confidence that it will be successful. In it are the potentialities for regularizing the industry without regimenting it; for assuring conservation, without destroying competition; for protecting initiative and enterprise; for ending the demoralizing alternation of flood and drought; and for insuring the fullest possible recovery from our reserves of petroleum.

Adequate Supplies

This thumbnail sketch of a decade's progress justifies our avowal that the industry is now in a state in which the elements of hazard and uncertainty have been largely eliminated, and that these will continue to decrease as the years pass. The present report, we confidently believe, will justify this judgment. Its discussion of the probable demand and substantially assured supplies of crude oil and of the advances in production, refining, and legal factors should dispel fear of a petroleum shortage and insure orderly production. Within any reasonable future, production can be increased or decreased in conformity with requirements, and can be maintained on a basis that will avoid waste.

Along with increase in yields, better refining insures constantly increasing recoveries of the most valuable fractions of oil. The industry has brought its operations well within the definition of conservation as "efficient and economic utilization." It is now possible to give assurance that known reserves, plus development of those certain yet to be located, plus substitutes whenever these may be required, will meet every military and naval need and the demands of the consuming public. Ample motor fuel will be available when it is needed, and when economic conditions justify, from alternative sources such as coal and shale.

Our inquiry into the adequacy of petroleum products for the future may properly begin with a consideration of the probable future demand. We have analyzed the factors which may be expected to determine what that demand will be: the country's probable gain in population, the increase in motor-car registrations, the requirements for petroleum derivatives for other than automotive uses, and various others. Consideration has been given to probable changes in internal-combustion power plants as these will affect demands for fuel. The increasing ratio of gasoline recovery from the barrel of crude has been given due weight; and from all these factors, in the light of experience, we have carefully estimated demand over five-year periods for the next 25 years, that is, until 1960.

Motor-Fuel Demand

Our calculations conclude that population will increase from the 122,775,000 of 1930 to 146,000,000 in 1960; that by 1960 there will be 31,100,000 passenger cars, as against 22,400,000 in 1935; and 6,000,000 motor trucks in 1960 as against 3,600,000 in 1935; total passenger cars and trucks in 1960, 37,100,000 as against 26,000,000 in 1935.

In 1935 the average motor vehicle is using annually 690 gallons of motor fuel. This is expected to increase to 730 gallons in 1940, partly due to the increase in trucks; after which, because of the trends toward lighter cars and changes in engine design, a continuing reduction is expected, bringing the requirement down to 670 gallons in 1960.

Other than automotive purposes now demand about 10 percent of the annual motor-fuel production; and it is believed this ratio will remain substantially unchanged.

Other Domestic Demand

The barrel of petroleum of 1960 will continue to be drawn upon for many other products aside from motor fuel. Our calculation aims to meet domestic demands for kerosene and lubricants, fuel for ships' bunkers, naval use, house heating, and all other economic uses. We have not given consideration to imports and exports as factors in the equation, but have aimed to weigh the probable supplies from domestic sources against anticipated demands for domestic use. With all factors in mind, it is estimated that the peak of demand for crude oil will be reached in 1950, at 1,109,800,000 barrels; thereafter dropping in 1960 to 1,071,020,000 barrels of crude as against 719,500,000 barrels for domestic use in 1935; and that in 1960, 57.88 percent of crude will be converted into motor fuel as against 43.76 percent in 1935. Expectation of so great an increase in motor-fuel recovery is not mere conjecture. Refining improvements already developed, and in some cases in operation, assure that this recovery is practicable. On this point a little explanation, for persons not familiar with refining, will be appropriate.

Refining

Petroleum is a mixture of many substances, which boil and vaporize at different temperatures. A quantity being introduced into a still and subjected to gradually increasing heat, the lightest elements vaporize first, and escape much as steam from a tea kettle. These very light vapors condense as gasoline; then, under a somewhat higher temperature, the kerosene vaporizes, and is in turn condensed; next the still heavier elements, which become lubricants, paraffin, and the various other products—leaving as a residue asphalt, heavy fuel oil, coke, etc. Such is the simple statement of bare elements in the process of refining by distillation. This simple treatment, however, recovers a motor fuel hopelessly inadequate in amount and quality. To increase the motor-fuel recovery and raise its quality, elaborate and expensive processes are necessary, making a modern refining plant one of the largest and most complex of industrial establishments.

More Products With Cracking

The first commercial process for making gasoline by "cracking" was developed about 25 years ago. The molecules composing the lightest elements of petroleum are very small; hence the high volatility of gasoline and the but slightly lesser volatility of kerosene. Getting down to the heavier parts of the oil, the molecules are larger, and the volatility less. It was found that when these heavier parts were subjected to great heat and pressure, the molecules broke up and be-

came as volatile as the lighter parts. Nearly the entire barrel of crude can be cracked when economically desirable.

The art of refining petroleum has progressed to the point where, through the use of modern equipment, the volume of refined products now equals within a fraction of one percent the volume of the crude oil run to stills.

Since the cracking process came into use, gasoline recoveries have steadily increased. So recently as 1914 only one-sixth of a barrel of crude oil was made into gasoline; by 1926, largely due to cracking, 35 percent of the crude; and today, a weighted average of 44 percent of the crude oil is converted into gasoline. This represents the average of all operating plants — including the modern, efficient plants giving maximum gasoline yields, and small, inexpensive skimming plants which yield a minimum of gasoline. Many companies in the industry constantly carry on research and experimental work to improve the quality and increase the yield of the more valuable products; from $10,000,000 to $12,000,000 goes annually into this work.

Cracking alone has produced since 1920 an amount of gasoline which without cracking would have required 6,600,000,000 barrels of crude; that is, an amount equal to 75 percent of all crude produced in the last 10 years. So rapid is the march of improvement that in almost no other industry has the rate of plant obsolescence been so great. Cracking units which cost millions and were the last word in modernity five years ago would today be well advanced toward obsolescence unless kept currently modernized.

Because of these advances in discovery, production, and refining, it must be conceded by any fair analyst that the danger of a petroleum shortage is remote. That being accepted, we may next inquire whether there are any other conditions peculiar to this industry which warrant singling it out for special and drastic control by government.

The notion that there is any element of monopoly in the industry lingers only in minds that still think in terms of a generation back. Rather, this is about our most competitive industry; its critics have conceded this, for they base many of their most severe censures on the charge that it has been unable to prevent excesses of competition. No industry's securities are more widely and popularly held; none presents less opportunity for concentration of ownership or control.

Low Prices

The most convincing proof that no monopolistic control has gouged the consumer is found in the showing of this industry's prices in comparison to the price trends of other industries. United States Bureau of Labor Statistics index of commodity prices shows petroleum products rank low in the list. The average retail price of gasoline, ex-tax, is less than half what it was 15 years ago. In 1920 it was 29.74 cents per gallon; in 1934 it was 13.64 cents—these figures being averages for full years and for 50 representative cities in 48 states.

Further to emphasize our insistence that there is no monopolistic or other condition because of which the industry deserves punitive treatment at the hands of the government, the low price which the American motorist pays for motor fuel should be compared with the much higher prices in other countries, notwithstanding that a number of such foreign countries produce all of their own crude oil.

All monopolies are bad, but government monopolies have invariably been the worst of all. They exclude the driving forces of invention, enterprise, improvement, efficiency; they always tend to freeze the monopolized industry in the phase of development in which the governmental bureaucracy found it.

Wide Distribution of Ownership

Far from being the bonanza that its critics charge, the oil industry is one of low earnings. Its extremely rapid growth since the motor epoch began has constantly demanded great amounts of new capital. These have come into it from millions of investors, putting their money into thousands of different enterprises. As these enterprises multiplied, competition between them became constantly keener. The evidence of it is to be seen on every hand: in the great number of outlets for petroleum products, in the heavy advertising expenditures, in the rush of rival concerns to get control of acreage in every new oil field. The difficulties which both the industry and governmental agencies have encountered in their effort to prevent over-production, of both crude oil and products, are evidence that competition is everywhere. State administrators, assisted by federal authorities in cases where interstate shipments were involved and state laws were consequently inadequate, have employed drastic measures to prevent illegal production, refining, and marketing. In these efforts the state

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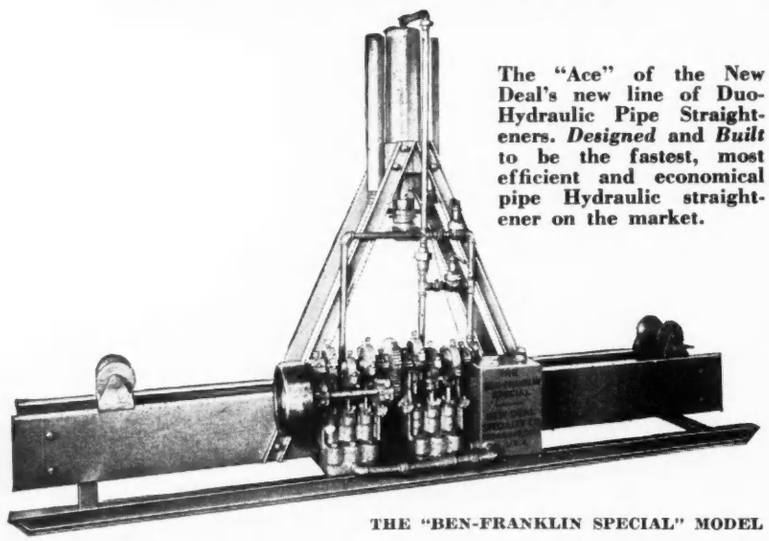

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authorities have cooperated with the industry for stability, and their measures are now attaining such efficiency as to insure continuously better conditions in the future and to deprive critics of what has been in the past their most tenable justification for complaint.

Moderate Earnings

So recently as 1906 the best authorities estimated investment in the industry at $750,000,000. In 1911 the total investment was estimated from $2,050,000,000 up to $2,750,000,000. By 1927 investment had grown to about $11,000,000,000, and is now around $12,000,000,000.

During the 12 years, 1921-1932 inclusive, with average investment slightly over $10,000,000,000, the industry's net earnings were calculated as $1,994,000,000. In three of those 12 years the industry as a whole showed a deficit; in its best year it earned 4.96 percent; and average annual net earnings over the 12 years were 1.66 percent. These figures are from the reports of companies representing 85 percent of the investment in the industry, the remainder being carefully estimated.

A World Industry

In the technique of producing, refining, and transportating oil America has constantly led the world. Indeed, a very considerable export business consists in furnishing other countries with oil-field and refinery equipment, while American petroleum engineers are in demand wherever petroleum is found. Petroleum and its products constituted 10.7 percent of the nation's exports in 1929; 12.8 percent in 1930; 11.2 percent in 1931; 12.9 percent in 1932; 11.9 percent in 1933, and 10.7 percent in 1934. The only staple whose export has exceeded petroleum in recent years is cotton.

Transportation

It has been suggested by a few that pipe lines ought to be divorced from the companies which own them. It is, therefore, desirable that there should be a clear understanding of the part that transportation plays in the industry's operations. Petroleum and its chief products are bulky, and of low value in proportion to weight. If the industry had not perfected a transportation system peculiarly its own and much less expensive than any other, petroleum products would cost the consumer much more than they do. From the beginning, transportation has been an important factor in the industry. When the first pipe lines were built in Northwest Pennsylvania, the horse-and-wagon haulers of petroleum ripped them out of the ground lest their competition interfere with the older mode of transportation. From that time to this, the progress of the industry in providing cheap transportation has periodically met with opposition from one quarter or another. If pipeline divorcement were compelled by law, this would inevitably necessitate higher prices for petroleum products as is demonstrated in the part of this report devoted to transportation.

The industry's transportation establishment comprises some 112,000 miles of pipe line; 350 tank ships of over 2000 tons, and a great number of smaller vessels; canal, river, and lake barges; over 150,000 railroad tank cars almost all owned by the industry; and about 130,000 trucks. With this must be included dockage; terminals, storage, and like facilities. This transportation system is conservatively estimated to represent an investment of $2,000,000,000—one-sixth of the entire investment in the industry. On December 31, 1934, 26.5 percent of all American maritime tonnage of 1000 tons or over was tankers. This did not include lake or river tonnage.

Petroleum pipe lines are plant extensions; they serve no other industry, and are as much a part of the vast petroleum plant as is the smoke stack of a factory. The transportation act of 1906 made them common carriers, and they have rendered that service whenever it was demanded—and rendered it so satisfactory that it is believed only two complaints have ever been brought before the Interstate Commerce Commission.

To divorce the pipe lines would wreck the coordinated transportation system which now serves the industry and the public. The pipe line, the tank ship, the railroad tank car, the tank truck, the barge on ocean, lake, river or canal—all are closely articulated parts of the system. To amputate one would destroy the entire organism. Of them all, the pipe line is peculiarly essential as a plant facility; and the reasons why it could not, without calamitous results, be operated independently of the other divisions of the industry are fully explained in the transportation section of this report.

Marketing

Among the four main divisions of the oil industry — production, transportation, refining, and marketing—the last is the point of closest contact with the public. The student of its marketing problem must keep in mind that the industry's history falls into two periods. The first began with production of oil by drilling, and lasted until the advent of the motor car; the second covers the automobile era, in which the thirst for motor fuel has necessitated a revolution in nearly all processes and practices.

Distribution

When it started, this industry was unique; there were no precedents for it. It had to devise equipment and methods for all its operations. Production of oil from the earth was unrelated to any of the older mining methods; transportation required a completely new and individualistic system; refining not only demanded new methods and apparatus, but required that these be revolutionized every few years to keep pace with the multiplication and improvement of products and the increasing demand. When we come to marketing, we find again that a complete system had to be set up. Twenty-five million motor cars continually traveling over the face of a continent must have supplies—and service—everywhere and all the time. The demand knows no holidays, no Sundays, no relaxations. So, while other petroleum products commonly moved through the ordinary channels of distribution, those which immediately concern motor-car operations had to be provided with their own merchandising organization and methods.

In the earlier automobile years the lack of universal fuel distribution was a chief annoyance to the motorist. Without its service of supplies, the motoring public would be as helpless as an army without its commissary. To provide this service has required a great investment, and a much larger personnel than is employed in any other branch of the business. The capital has come in part from the refining companies, and is represented by their service stations; but in much larger part distribution has been provided by in-

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Service Stations

As a rule, the service stations engaged in the distribution of petroleum products are owned by local, independent dealers and distributors. The large distributing companies, while owning comparatively few service stations, in the construction of their company-owned stations have endeavored to set a high standard, and this standard in many cases has been followed by independent dealers. In constructing its own stations, each company seeks to make its service stations, in point of architecture, decoration, color scheme, and appointments, as characteristic and as uniform as possible. These are their best advertising, and proclaim such company's responsibility for the quality of products and service. There is real competition in these respects; and the public benefits because of the high quality of products, services, and conveniences at such stations. This helps to fix a standard for all distributors. Until that standard was set up, the motorist had no guarantee of the goods he bought, and service was practically unknown. If his radiator needed water, he could hustle for a bucket of it; if a tire was down, he could get out, jack up the axle, and groan through the grimy operation of changing it, and break his back over a hand air pump.

All these woes of pioneer motoring days are now well-night forgotten; the ready, courteous, and expert attendant looks after the tires, fills the radiator, changes the oil, wipes the windshield, gives road directions, warns about uncomfortable detours, furnishes highway maps— and politely shakes his head when a tip is offered. Small wonder it is called a "service" station.

Service and filling stations are necessarily numerous because the motorist is numerous, and wants what he wants where he wants it and when he wants it. Moreover, as comparatively little capital is needed for independent filling stations, these have provided employment to a multitude of people in the depression years.

Reference is made to the marketing section of the report for a full discussion of the service-station problem.

We have heretofore shown how the consumer's price for motor fuel, ex-tax, has been progressively reduced until it is now less than half what it was in 1920. Despite the universality of distribution and the many free services, marketing costs for motor fuel are less than for most commodities. A recent study of marketing costs by the National Cash Register Company covered department stores, druggists, shoe stores, restaurants, furniture, florists, jewelers, specialty stores, stationers, variety chains, automobile jobbers, electrical supplies, groceries, and motor fuel; motor fuel showed the lowest marketing costs with the single exception of groceries.

Demand for motor fuel fluctuates, both seasonally and regionally. It is greatest in summer, least in winter. So gasoline made in winter in excess of seasonal demand must be stored and carried until warm weather — which is expensive. Nevertheless, the fluctuations in motor-fuel prices are vastly less than in most other commodities, a fact which will not have escaped the notice of any housewife who does her daily marketing. Over the last year, for example, she will have noted—and bemoaned — a continuing increase in the prices of about everything she buys—except the fuel for her car. She will have noted also the common experience of paying $1.25 for some article, and later, within the same city block, finding the identical article offered for 73 cents.

Price Changes

Motor fuel is the one commodity in which the changes in price are always announced as a matter of news. Prices are plainly posted at distributing places, and in some states such posting is required by law. The motorist who is charged an extra cent at one station knows it before he has traveled a mile, for at the next station he will have seen a lower price posted. This system of universal posting accounts in part for the comparatively small variation in motor-fuel prices as between service stations; it also explains why, as a rule, changes have to be made practically at the same time by most distributors in a given area. Economic forces compel changes; when these dictate a reduction in price, conditions of competition compel all others to go along whenever one distributor lowers his price. When the cycle swings the other way, similar considerations produce like results. Uniformity of price proves, rather than refutes, the existence of severe competition. Other commodities whose marketing conditions are analogous—for example cigarettes—show the same results from similar causes. There is nothing more recondite about it than there is about the fact that everybody who buys New York Central shares at the same time on the New York Stock Exchange buys them at the same price; or that all buyers of hogs at the Chicago Stockyards pay the same prices at the same time.

Gasoline price wars are sometimes caused by those who, seeking larger volume, cut their retail mark-up. Competitors in the neighborhood must meet the cut, and quite often meet it with a greater one in order to recover lost gallonage; and so the price war is on. Such practices are unfortunately common in all retail marketing; and are not alone peculiar to the marketing of gasoline.

Gasoline Tax

In the case of motor-fuel prices, there are some elements which do not enter into making prices for other commodities. The average tax on gasoline, over five cents per gallon, is always a temptation to the dishonest distributor. If he can evade paying the tax to the state, he can pocket it or use it to under-sell his competitor who does pay the tax. Thus he wrecks the price structure, tends to drive the honest dealer out of business, and robs the state of its revenue. The procedure is simple enough, but to stop it has required the intervention of legislatures and Congress, the activity of investigators, the work of prosecutors, and the constant cooperation of the great honest majority in the industry. In many cases the industry, rather than the state, has had to bear the chief burden of detecting and preventing tax evasion.

Illegally-produced or "hot" oil is a fertile source of supply for bootleg marketers, and in their hands is quite certain to be an incentive to price wars. Thanks to the effective legislation that most states have enacted, and to the determined efforts of the industry, the production of "hot" oil has in recent time been greatly reduced, and is now believed on the way to suppression. When it shall have been

eliminated, and the interstate conservation compact been brought into full operation, there will be left little ground for serious complaint.

But the industry will still have ground for grave protest against extremes of taxation. These will continue to tempt the bootlegger and to menace the marketing structure so long as federal, state, and local governments continue excessive gasoline taxes. Motorists who pay them, the industry which suffers from them, and all fair-minded citizens recognize that these imposts are unjustifiably high, and constitute an indefensible discrimination against the industry and the motoring public. Yet legislators who, seeking necessary revenue, bitterly denounce the idea of a 2-percent or 3-percent general sales tax, have not hesitated to vote for a 100-percent sales tax on the wholesale price of gasoline.

Public Revenues

The petroleum industry calls attention to the fact that it is, of all our industries, the greatest contributor to public revenues. Not only does it pay more taxes, both absolutely and in proportion to its dollar volume of business, but it collects and hands them over to the government substantially without expense to the public treasury. In 1934 the industry paid in direct taxes, or collected from its patrons in excises on its products, $1,046,000,000—11 percent of all federal, state, and local taxes. The federal government took one cent on every gallon of gasoline; the state gasoline taxes averaged 4.2 cents; and hundreds of cities, counties, and other local jurisdictions added still further taxes.

The gasoline sales tax, now collected in every state, ranges from two cents to seven cents a gallon. Last year it produced for the states $565,027,000; and for the federal government $170,109,269. Further the federal tax on lubricants brought in $24,842,000.

So long as the gasoline-tax rate was within reason and the funds were used for highways, neither the industry nor the motorist objected. But in recent years the fund has been drawn upon for endless other purposes; and so serious has become this diversion that Congress has issued a solemn legislative warning against it. The Hayden-Cartwright act of 1934 declares it is "unfair and unjust" to use gasoline and other motor-vehicle taxes for any except highway purposes, and orders the withholding of a certain portion of federal funds which otherwise would be given the states for highways.

Employment

The oil business employs directly about 1,000,000 people, and in 1934 its payroll was nearly $1,250,000,000. Indirectly, its purchases from other industries provides employment for another army of workers. It has been notably free from labor troubles, due to liberal policies in dealing with a large and exceptionally high-grade personnel. Since the bottom of depression was touched in the spring of 1933, its employment has steadily gained. The Department of Labor shows that from May, 1933, to July, 1934, employees increased 37.3 percent—not including the marketing branch. If this be included, 170,000 people were absorbed into re-employment during this period of 14 months; and the increase has continued since.

These results have been due chiefly to the industry's hearty cooperation in efforts to end unemployment. Working hours per week were reduced about 30 percent, but because of liberal per-hour wage advances, employees did not suffer in buying power. The Department of Labor places this industry at the top of the list in re-absorption of workers. It also shows that whereas average hourly earnings of all employees in manufacturing in June, 1935, were 57.5 cents, in petroleum refining that average was 80.4 cents; employees in drilling and production averaged 77.5 cents per hour.

Refinery employees average 34 percent higher wages than all manufacturing employees in the country. Production and drilling employees were the fourth highest paid group among all workers in non-manufacturing industries. Filling-station employees are shown, by the latest data, to have been earning slightly more than the average of retail sales workers; and many of them have since had their wages considerably advanced. When these wages are translated into terms of purchasing power, it is found that this industry's employees are in the same or better position than they were at the peak of good times in 1929, despite the fact that they now work much shorter hours.

Because its operations are widely scattered, the industry has frequently been called upon to provide housing for employees in remote and sparsely inhabited areas as well as in its refining centers. In respect to such service, your committee is convinced that this industry would emerge with high honors from a systematic comparison with the corresponding activities of any other industry in the country. To these and many other manifestations of concern for the well-being of employees, such as insurance, pensions, prevention of accidents and compensation for them, may be attributed the consistent loyalty of workers and the industry's long immunity from labor troubles. Strikes have been almost unknown even in the most disturbing times, and have been unimportant. The rate of employee turn-over is found by the Department of Labor to be exceptionally low. In short, your committee feels that the industry is entitled to view with pride its relations with employees, and its general handling of the problems of wages, hours, and working conditions, as is shown by data in the labor section of this survey.

Conclusions

In conclusion to these prefatory observations, your committee wishes to emphasize its convictions on a few important points:

1. There is every reason for confidence that the requirements of petroleum products to meet national needs and the demands of the consuming public will be met.

2. The known reserves are today well over 100 percent larger than those estimated 10 years ago, or at any time previous to 1925. These reserves should

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not be drawn upon at a rate more rapid than will be consistent with the ultimate recovery from them of the maximum required products. Thus managed, the reserves, together with new discoveries, which on the basis of experience we may confidently anticipate, should relieve us of any possible apprehension regarding our supplies over the next 25 years.

3. At the expiration of this 25-year period, or indeed at any other future time, there will still be sound insurance against any crisis concerning petroleum supplies. This insurance includes the certainty of large additional recoveries from old oil fields, which are not estimated in the present survey, but which improved methods of recovery will assuredly make available. Beyond this, in the further background, are the practically unlimited reserves from substitutes (coal and oil shales) waiting to be developed whenever economic conditions justify. With greater confidence than has ever before been possible, the assurance can be given that requirements will be met.

4. Each generation is entitled to the use of those resources which it finds at its hand; but it is not entitled to waste them. The price for crude oil should always be such as to insure production in sufficient quantities, at a reasonable profit. Under these conditions, oil will be produced by the best methods and with a view to the largest ultimate recovery from each field. As conditions justify, we may confidently rely upon the continued development of better methods in recovery, and progressive economy in utilization.

5. Because transportation is so vital, the industry has developed—as part of its plant —a complete, articulated, economical, and independent transportation system. This system perfectly meets the industry's requirements, and has no possible usefulness to any other industry. Therefore, we insist that no part of our transportation facilities should be severed from the body of the industry. Such severance would inevitably impair efficiency, add to the expense of operations, and increase the cost of products to the consumer. There is no significant demand for pipeline divorcement but, rather, an overwhelming preponderance of opposition.

6. Unremitting prosecution of scientific research and practical experiment in refining have served the public's interest by multiplying the industry's products, widening their fields of usefulness, and reducing their costs. New demands have persistently arisen, and just as persistently have been met. New processes have been devised and old ones bettered, regardless of expense or effort. Versatility, adaptability, and economy have guided the industry's advance under the urge of competitive conditions.

7. Among employers and employees alike, there is such general satisfaction with labor conditions as we believe could be matched in few other industries. This is true as to wages, working conditions, and all factors which make for relationships of mutual confidence and loyalty; and throughout the years of depression employment has been maintained without sacrifice of traditional high standards.

8. In the last 15 years this industry has become the greatest single contributor to public revenues; it produces 11 percent of all taxes paid into government treasuries. These excessive and discriminatory taxes add heavily to the prices which consumers must pay for petroleum products, and are responsible for many of the industry's most difficult problems.

9. Government domination would remove the urge and paralyze the forces that have made for progress. It would mean calamity to the industry, and disaster to the public. The record shows how invariably the benefit of economies, invention, and improvement has been passed on to the public in lower prices, better products and service. On that record we bespeak a candid, considerate judgment — confident that it will favor continuance of the industry's independence and self-control.

10. This most typically American industry has been created in the last three-quarters of a century. No other industry has faced so complex a situation by reason of the peculiar and fugitive character of its raw material. It has met tremendous responsibilities both in peace and in war, and has never failed in their discharge. We have every confidence that it will not fail in the future, unless prevented by governmental restrictions.

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NEW PRODUCTS FOR THE FIELD
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DIESEL TRACTORS
Caterpillar Tractor Company

Caterpillar Tractor Company, Peoria, Illinois, has announced four new Diesel tractors that will be known as RD-8, RD-7, RD-6 and RD-4, and a spark ignition machine called the "Thirty." The first three models succeed the Diesel Seventy-Five, Diesel Fifty and Diesel Forty formerly manufacturd by the company and are comparable to them in everything except power. The new models are much more powerful than the old, it is claimed, because of the increase in cylindr bore from 5¼ to 5¾ inches.

The new RD-4 and Thirty are companions in outer dimensions, chassis, transmission and tracks. Many of the engine parts also are interchangeable. The new machines have a higher ground clearance than the old models. The Diesel model weighs only 400 pounds more than the new Thirty and about 300 pounds less than the old. The RD-4 consumes about 1¼ gallons of low cost fuel per hour.

Drawbar and belt horsepower of the five new models are:

	Drawbar H.P.	Belt H.P.
RD-8	95	110
RD-7	61	70
RD-6	45	51
RD-4	35	41
Thirty (spark ignition)	35	41

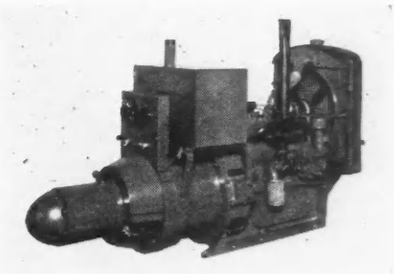
DRILLING CLAY
Baroid Sales Company

Baroid Sales Company, Los Angeles and Houston, has announced "Baroco," a new drilling clay for Mid-Continent and Gulf Coast operators. According to the manufacturers, one ton of this clay makes 40 barrels of excellent 15 centipoise drilling mud and saves from 25 to 50 percent in the cost per barrel over available native clays. When mixed with water, the clay will make a very satisfactory drilling mud for all-around use, it is claimed. Because it contains a higher percentage of gel-forming colloidal matter than commercial or native clay ordinarily available for drilling mud, it is said to build a better wall and build it more quickly than other clays.

In addition to its economy and wall-building properties, the clay is specially selected and processed to resist the "flocculating" action of salt and salt waters. Mud made from this clay is substantially unaffected by contact with salt or salt waters, it is claimed, and satisfactory drilling muds can be made by mixing it directly with salt water. It is especially recommended by the manufacturer for drilling on salt domes or where it is expected that salt water will be encountered.

WELDING MACHINE
The Lincoln Electric Company

The Lincoln Electric Company, Cleveland, Ohio, has announced a new 200-ampere special engine driven "Shield Arc" welder. This new model, known as the "200 ampere Shield Arc Special," supplies a uniform current for welding with bare or heavily coated shielded arc type electrodes in all sizes up to ¼ inch. The welding current range of this new machine is from 60 to 250 amperes. Its generator is the single operator variable voltage type with completely laminated magnetic circuit and equipped with interpoles, and requires no external reactance or stabilizer. The patented Lincoln dual control of welding current is provided adjustment of both series and shunt fields. Separate excitation of the generator shunt fields is supplied by an exciter connected on the generator end of the unit. A generator field rheostat and a current regulating switch are mounted in vertical position on a "dead-front" steel control panel.



Lincoln Electric Welding Machine

Electrode and ground cable connections of the wing nut type are also in an easily accessible position.

The welder is powered by a Waukesha four-cylinder engine which delivers 23 H.P. at 1400 R.P.M., the speed at which the welder is operated. A gear driven governor maintains proper engine speed at all load conditions. The engine is equipped with standard high tension magneto and vertical type carburetor with air cleaner.

TUBE CLEANER
The Roto Company

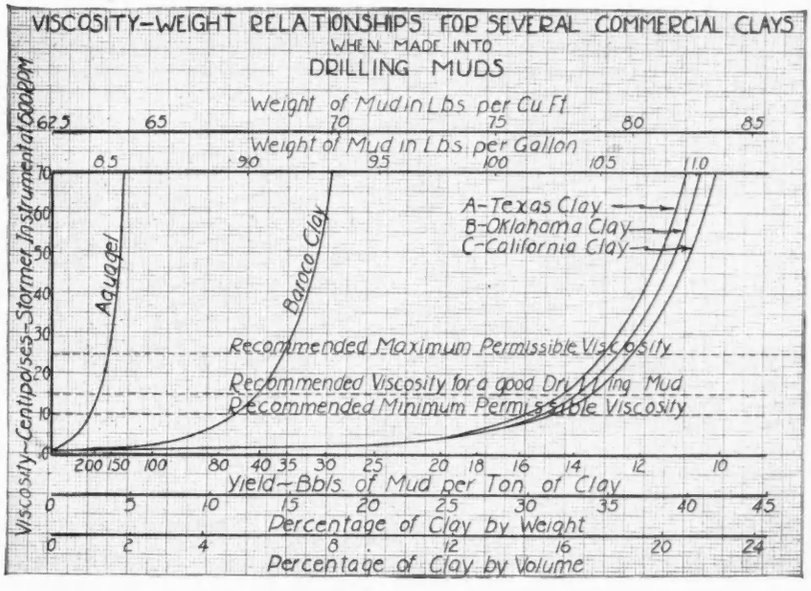
The Roto Company, Newark, New Jersey, has announced an improved cleaner for small diameter tubes, such as are used in heat exchange units and similar apparatus. The new cleaner is air driven and entirely self contained, permitting a number to be operated simultaneously in the same unit. It will effectively clean straight tubes as small as five eighths of an inch and curved tubes as small as seven eighths of an inch O.D. The motor has only two moving parts and operates at a pressure of from 30 to 75 pounds, with an air consumption of from 12 to 20 cubic feet of free air per minute.

TEXAS COAST MAP
Gulf Coast Engineering Company

An ownership map extending from the town of La Ward in Jackson County to the town of Sinton in San Patrico County, South Texas Coast area, and embracing parts of Jackson, Victoria, Calhoun, Refugio and San Patricio Counties has been prepared by Gulf Coast Engineering Company, 1014½ Capitol Avenue, Houston. The map shows all producing fields and wildcat dry holes within the area.

DIESEL ENGINES

Couched in a simple, direct way and avoiding technical discussion throughout, a new rotogravure booklet, the "Whys and Hows of Diesel Engines", has just been issued by Caterpillar Tractor Company of Peoria, Illinois. Principal topics are headed, "Why the Diesel?", "How Does the Diesel Run?", and "What Do Owners Think?" The cover reproduces photographs of a Diesel tractor, streamlined trains and a Diesel-powered submarine, and the text is interspersed with illustrations.


VISCOSITY-WEIGHT RELATIONSHIPS FOR SEVERAL COMMERCIAL CLAYS
WHEN MADE INTO
DRILLING MUDS
Weight of Mud in Lbs. per Cu Ft.
62.5 65 70 75 80 85
Weight of Mud in Lbs. per Gallon
8.5 9.0 9.5 10.0 10.5 11.0
A-Texas Clay
B-Oklahoma Clay
C-California Clay
Aquagel
Baroco Clay
Recommended Maximum Permissible Viscosity
Recommended Viscosity for a good Drilling Mud
Recommended Minimum Permissible Viscosity
Viscosity-Centipoises-Stormer Instrumental 600 RPM
0 10 20 30 40 50 60 70
200 150 100 80 40 35 30 25 20 18 16 14 12 10
Yield-Bbls. of Mud per Ton of Clay
0 5 10 15 20 25 30 35 40 45
Percentage of Clay by Weight
0 2 4 8 12 16 20 24
Percentage of Clay by Volume

Squeaks from the Bull Wheel

Who Will Claim It?

"Last week after one of the leading civic clubs had held its noonday luncheon at the Hotel Tulsa a note book was found under one of the tables which seemed to contain a good many notations and memorandums. There was no means of identifying the owners, but the following is a sample of what it contained:

May 1,	want ad for new stenog.....	.50
May 6,	salary, new stenog.....	15.00
May 7,	flowers for new stenog.....	3.50
May 8,	salary for new stenog.....	20.00
May 9,	luncheon self and stenog.....	2.10
May 11,	dinner and theater, self and Miss M.....	11.00
May 15,	roses for Miss M.....	5.00
May 16,	salary new stenog.....	28.00
May 17,	magazines, box of chocolates Miss M.....	3.80
May 19,	luncheon, self and Miss M.....	2.75
May 20,	candy for wife over Sunday....	.75
May 20,	salary new stenog.....	30.00
May 22,	Taxi on account rain Miss M...	1.00
May 23,	wrist watch, Miss M.....	35.00
May 25,	diamond ring for wife.....	500.00
May 26,	want ad, male stenog.....	.50

Warming Up

We heard a couple talking in the rear of a machine ahead of us. The man sighed, "Oh, dearest, you never have acted this way before. Always you have been cold toward me and now you're—

So I put on my brakes and pulled my radiator away from the back of their machine.

To Be Wished

She: "Oh, the monotony of this place! I fear before the day is over it will drive me wild!"

He: "May I come around this evening?"

Too Far

He—Do you like wearing evening dress?

She—I feel that nothing is more becoming to me.

He—I have no doubt of that; but wouldn't that be going a trifle too far?

The Difference

The difference between a cow and a baby is that the cow drinks water to make milk, and the baby drinks milk.

No Brains

The shades of night were falling fast,
The fool "stepped on it" and rushed past.
A crash—he died without a sound;
They opened up his head and found
Excelsior!

Best, and—

"Old friends are best, don't you think?"

"Well, yes and no. They have a wonderful way of remembering how old you are."

A Strong Siphon

"Good morning, Mr. Ryetop," said the waiter, "I hope you enjoyed that old Scotch I left in your room while you were out."

"It was pretty fair," drawled Ryetop, rubbing his parched lips, "but that siphon you sent up had the strongest stream of fizz water I ever tackled. The blamed thing came near blowin' me through the window."

The waiter looked puzzled. "Siphon? I didn't send up any siphon."

"Yes, you did. It was red and bound with brass bands."

"Great Scott! That was the fire extinguisher!"

Wanted to Be Sure

As the steamer was moving out of the harbor at Athens a well dressed lady approached the captain and pointed to the distant hills.

"Could you tell me what is that white stuff over there?" she asked.

"That is snow, madam," replied the captain.

"Well, I thought so myself," agreed the lady, "but a gentleman just now informed me that it was Greece!"

A Shade of Difference

"Knowledge and belief" was used for the text of a negro preacher and in explaining the difference between the two he said: "Now, brothers and sisters here on dis front seat sets Brother Jones and Sister Jones and in between them sets the six little Jones. Now, Sister Jones knows all them children is hern, that's knowledge, and Brother Jones believes all them childrens is his'n, that's belief."

In Wildcat Territory

A young lawyer from the North, sought to locate in the South. He wrote to a friend in Alabama, asking him what the prospect seemed to be in the city for "an honest young lawyer and Republican."

In reply the friend wrote: "If you are an honest lawyer, you will have absolutely no competition. If you are a Republican, the game laws will protect you."

She Meant Quit

Young Man: "Well, what are you stopping for?" as the taxi drew up in the middle of the block.

Taxi Driver: "Didn't I hear the young lady distinctly say 'stop'?"

"Well, she wasn't talking to you, was she?"

No Hurry

"I hope I can escape jury duty as I have important business to look after. But who's the stunning girl?"

"Plaintiff in the next case. A dog bit her on the knee."

"I guess I'll serve."

A Reformer

A lady in a restaurant was imbibing drinks so frequently that it was quite noticeable.

"Excuse me," a gentleman diner butted in, "but are you the president of the temperance society?"

"No, I have no connection with that organization."

"But I have seen your picture published in connection with some organization of that kind."

"Perhaps so; I am president of the purity league."

"Oh yes, I knew there was something you didn't do."

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After carefully reviewing the forms of a number of oil companies, The Gulf Publishing Company has made up six standard forms listed below and has produced these in such quantities as to enable oil companies to secure them at substantial savings.

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Form 101	DAILY TIME RECORD (In duplicate—100 sets to the book).....	1.40	6.00	9.50
Form 102	DAILY GAUGE REPORT (In duplicate—100 sets to the book).....	1.40	6.00	9.50
Form 103	WELL LOG AND RELATED DATA (8½x11, Printed both sides—100 to book)	1.50	6.50	10.50
Form 104	PIPE TALLY SHEET (In duplicate—100 sets to the book).....	1.50	6.50	10.50
Form 105	MATERIAL TRANSFER RECORD (In duplicate—100 sets to the book).....	1.50	6.50	10.50
Form 106	DAILY DRILLING REPORT—3 TOURS (In duplicate—100 sets to the book).....	1.50	6.50	10.50

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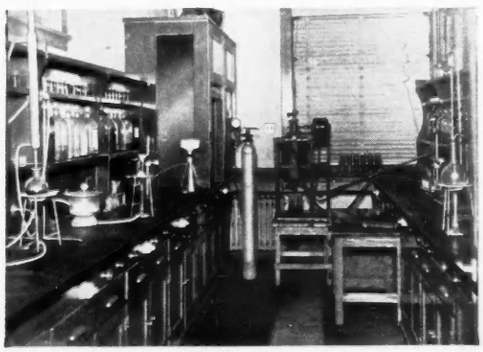

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